VOL. XI, No. 5 NOVEMBER, 1948

THE TOOL ENGINEER

OFFICIAL PUBLICATION: AMERICAN SOCIETY OF TOOL ENGINEERS

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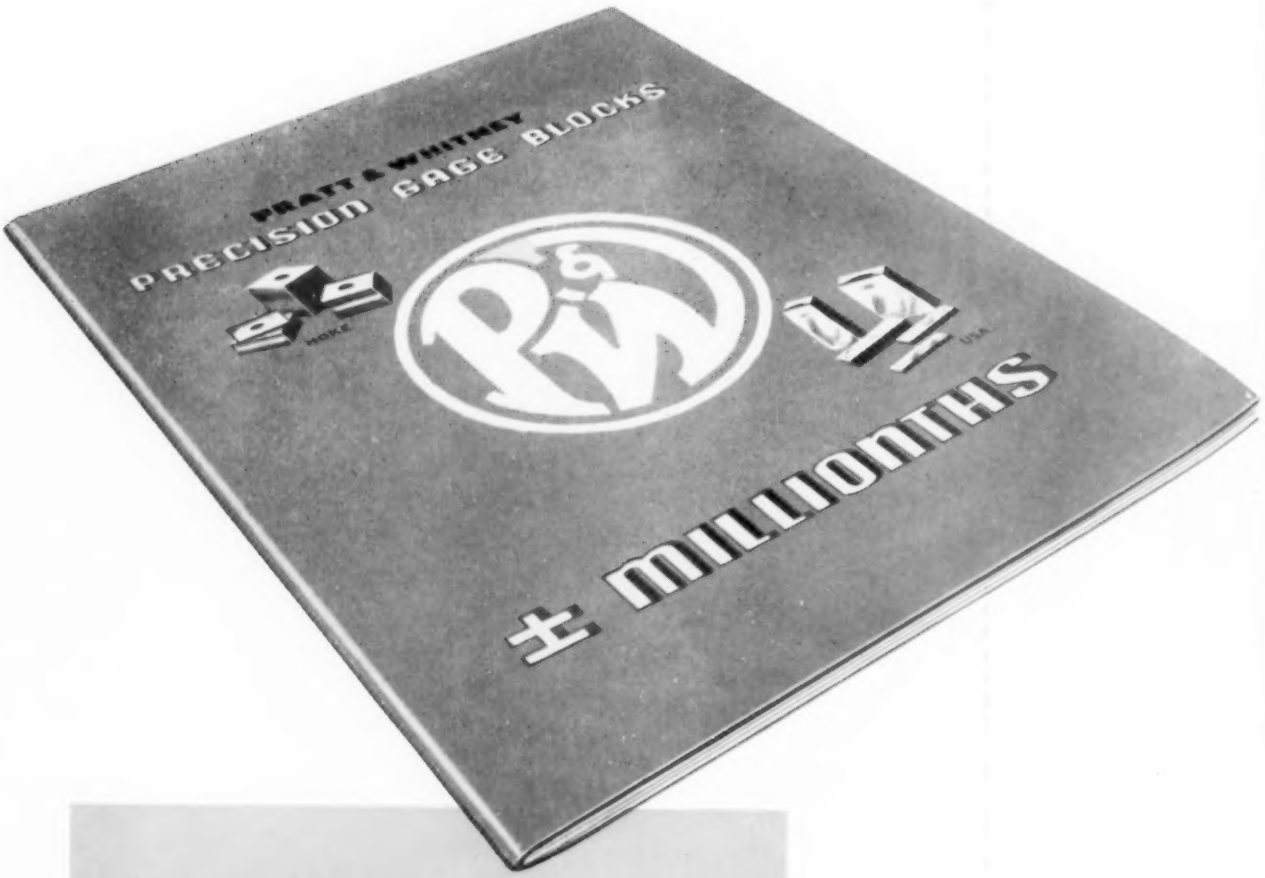

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The Tool Engineer

Official Publication: American Society of Tool Engineers

Nov., 1948

Vol. XXI, No. 5

Editorial

Thanksgiving Thoughts

THANKSGIVING season is a time for counting our blessings—for looking about us and seeing, as if for the first time, the really wonderful things for which we have to be thankful.

To enumerate the things, material and immaterial, which are our blessings, would be a task of impossible magnitude. But we can cover most of them by being thankful for our freedom—our freedom to write, to speak, to worship, to work each according to his own beliefs and abilities. From these freedoms have stemmed the scientific and cultural development and progress which have created the standard of living we enjoy today.

In 1620, a band of 102 Pilgrims landed on Cape Cod Bay. Before the end of the first year, the graves outnumbered the houses seven to one, historians report. But also, by the end of the first year, the progress of the survivors in providing for their needs of life had been such that Governor Bradford set aside "an especial day on which to give thanks for all their mercies."

Since a feast to which their Indian friends were invited was the principal event of this "especial day," many people think of Thanksgiving Day as one on which we express gratitude for our food alone. This, of course, is only a part of the picture, but a very important one.

It is an amazing thing that America is one of the few countries in the world completely free of fear of famine. The Pilgrims were more truly grateful for their scanty crops of barley and Indian corn than we are for the wide variety of foods we enjoy in abundance today. They had lived in fear of not having enough food. We take ours for granted.

This situation did not happen by accident. Blessed with natural agricultural resources, we have mechanized our tilling, sowing, cultivating and harvesting, enabling farmers to produce in quantity. We have developed scientific controls for plant diseases and insect pests. We have devised processes and machinery for the preservation of food. We have established rapid transportation systems that insure good distribution. Working as free men, in a free economy, we have insured ourselves an adequate food supply.

England, under socialism, and with a war burdened economy, is demonstrating what loss of such freedom can mean in terms of a nation's eating. In pre-war days, under a free economy, about one-third of the British population was below the poverty line standard of food consumption; by 1946, the whole of the population was at the poverty line.

The moral of that story is obvious. We in America, in being thankful for our material blessings, must cherish the way of life which has made possible our standard of living.

In his "A Short Outline of Thanksgiving," Ogden Nash wrote:

"This is the sum total of Thanksgiving lore:

Not to be thankful until you're tired of what you're being thankful for."

It is unfortunately true that Mr. Nash well describes the attitude of too many of us. The troubled world in which the 1948 Thanksgiving will dawn behooves our being thankful today for what we enjoy today. If we take it too much for granted, there might come a time when it would be too late to be thankful.

I. F. Holland

President 1948-49

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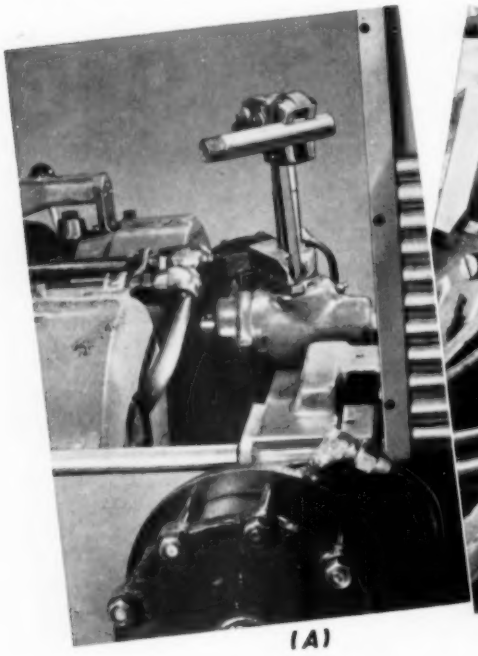
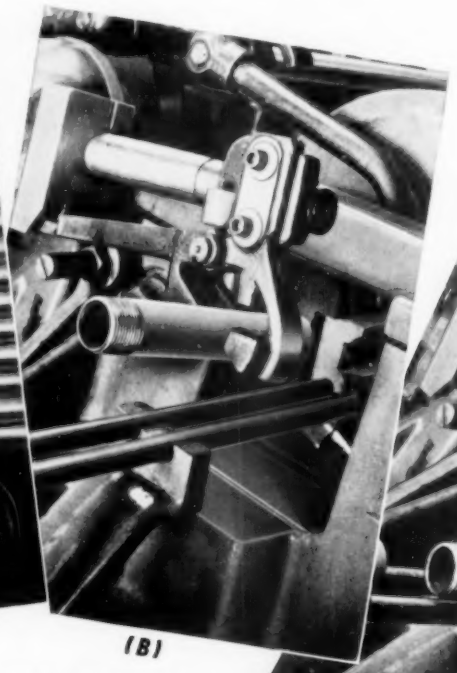


(A)



(B)

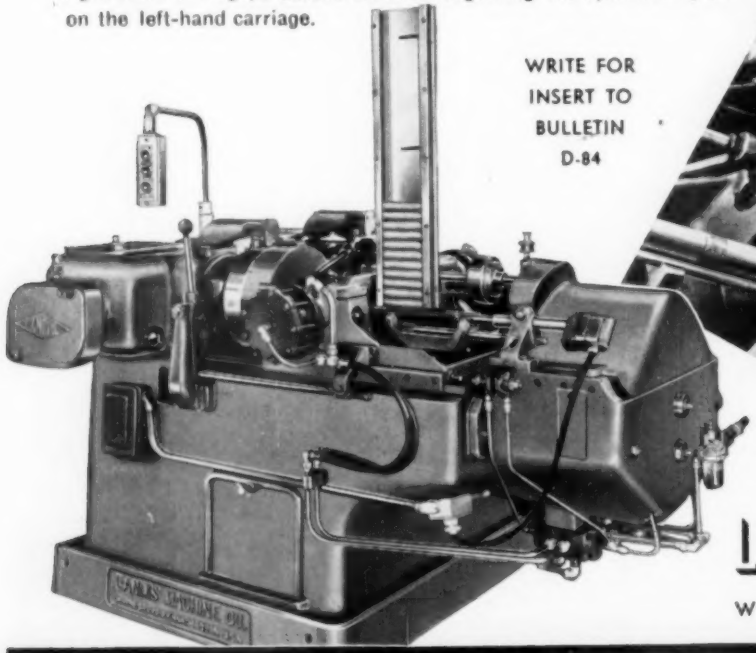
(C)

(D)

- New Transfer Mechanism allows longer running time

● The operation cycle, in which both ends of nipples are threaded, reamed, and chamfered, is completely automatic. During operation, the operator must only give the machine visual attention and keep the magazine filled. Blanks are released automatically from the magazine into the left-hand carriage, and fed into the die head at a rate equal to the lead of the thread being cut. Mechanical fingers pick up the semi-finished nipple and turn it end-for-end (A). The blank is placed on the work-rest bar of the right-hand carriage (B and C), and pushed into position for the operations on the unfinished end (D). Finished nipples are ejected automatically. Simultaneous with the operations on the right-hand carriage, a second blank is beginning the operation cycle on the left-hand carriage.

WRITE FOR INSERT TO BULLETIN D-84



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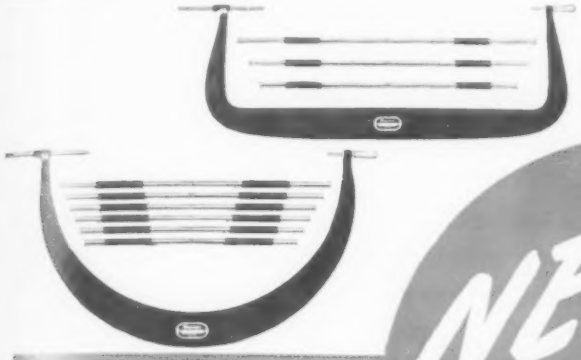

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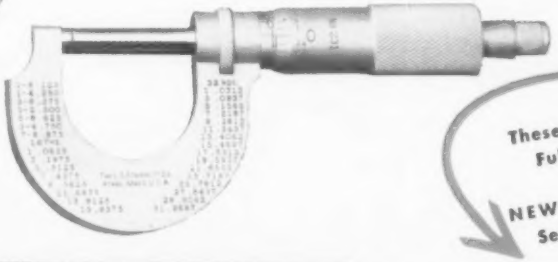

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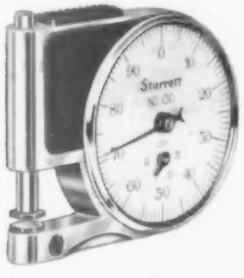

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A Vision Becomes a Reality

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A RADICALLY NEW and different method of producing vitrified grinding wheels, a method which would not only make them much faster but also much better—such was the vision of George N. Jeppson, chairman of the board of Norton Company. His ideas were turned over to Norton development engineers who set to work to bring them to fulfillment. There were many difficulties at the start, but gradually it became clear that Mr. Jeppson's ideas, as radical as they had first seemed, were basically sound. Grinding wheels were produced experimentally in hours instead of days and with a degree of uniformity that had previously seemed impossible in a vitrified product.

At the dedication of the new plant Mr. Jeppson presents Milton P. Higgins, President, with the ten millionth wheel made by new process

Pilot Plant Success Leads to $4,300,000 Investment

With the process proved in theory, the next step was to make it work commercially and a pilot plant installation was started for the production of small wheels. Soon this pilot plant was so successful that Norton Company was ready to invest millions of dollars in Mr. Jeppson's idea. Ground was broken in April, 1947 for the construction of a mammoth new building designed especially to produce wheels by this revolutionary process. The new plant, over 600 feet long and 320 feet wide, with its floor space of nearly five acres, has now been completed and is in production.

Over Ten Million Wheels Already Made

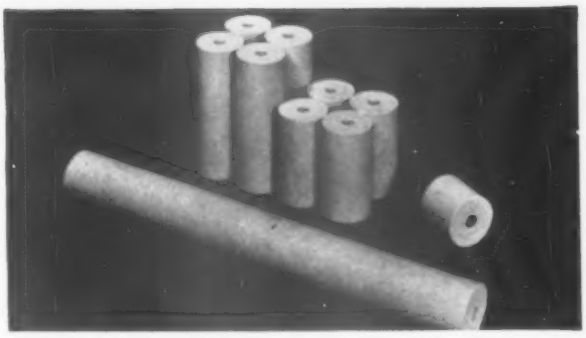
That the new process is a complete success has been definitely proved by the ten million grinding wheels already made by it, first in the pilot plant and for the last few months in the new building. Many customers, especially in the field of internal grinding, have been using the wheels and already have established the soundness of this revolutionary process in grinding wheel manufacture. They have found that the new wheels have perfect balance and perfect uniformity in structure, grade and color—from wheel to wheel and from lot to lot.

Straight Line Production

The new process lends itself ideally to straight line production and maximum use has been made of this in the new building. Abrasive grain and bond

A view in one corner of the new plant showing the production lines for the finishing operations on mounted points and wheels for internal grinding

brought into one end of the building and the various production steps take place one after another—*including a radically new and continuous electric firing process.* Modern conveying equipment has been extensively used so that handling is at a minimum. The building, the largest in the world for producing vitrified grinding wheels, not only houses the newly developed manufacturing equipment but also a cafeteria, hospital, modern locker and washrooms and offices. Over eighty per cent of the wall area is windows and with the monitor roof provides maximum daylight.



32 ALUNDUM wheels, 2 x 2½", made by the new process; dimensional accuracy is shown by evenness with which they stack up, and difficulty of distinguishing line between them

What the New Process Means to Grinding Wheel Users

Precise control is the keynote of the new process—precision mixing, precision molding, precision burning. And precision throughout manufacture means a precision product.

Precise Size

Grinding wheels made by this new Norton process are *dimensionally accurate* within thousandths of an inch—machine readjustments when new wheels are mounted are practically never necessary.

Precise Balance

Because of precision molding and precision burning, *precise balance* is inherent in the wheels—it's there to start with and it stays as the wheels wear down.

Precise Grinding Action

The control methods of the new process have brought a *new uniformity* to grinding action—throughout the life of each individual wheel, from wheel to wheel and from lot to lot. Each new wheel no longer brings a new grinding action and consequent machine adjustments.

Faster Service

Not only does the new process make wheels *better* but also *faster.* Burning time alone has been cut from a matter of days to hours. And there are the added advantages gained from straight line production. Many customers are already aware of the improved service that has been possible on small wheels through the earlier operation of the pilot plant.

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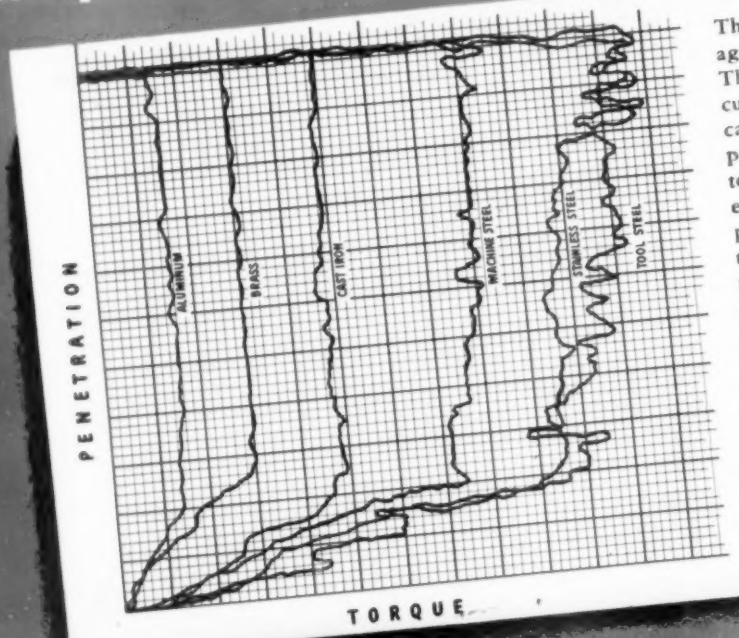
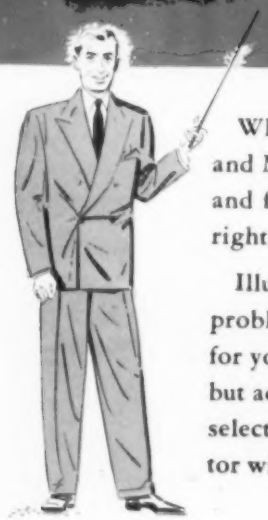
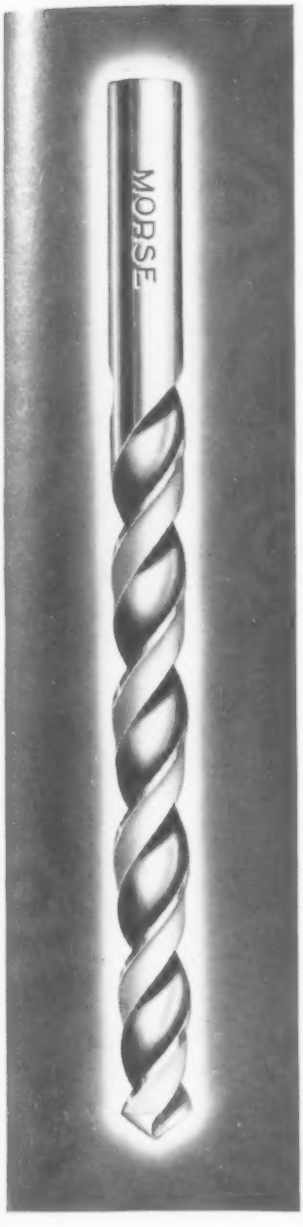


This chart shows drill penetration against torque in various metals. The curves are typical of a *series* of curves in similar tests. They indicate the performance of a special purpose drill as the design is altered for maximum cutting efficiency. Many "trial and error" tests preceded the one that produced the results shown and many other tests followed before the final design was approved. The high speed steel from which the drill is made, the helix angle, web thickness, heat treatment and angle of point are all variables that are studied and re-studied. This testing is typical of the continuous checking by the Morse Laboratory to develop drills that offer the best performance for special jobs.

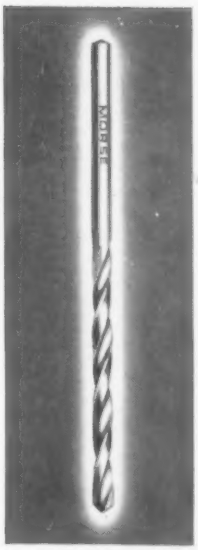


When *special* drilling problems prove troublesome, look to the Morse Laboratory and Morse engineering to meet the need in terms of *special purpose* drills. Morse skills and facilities *plus* long experience in the production of cutting tools that have proved right, is your assurance of the best working tool for *your* job.

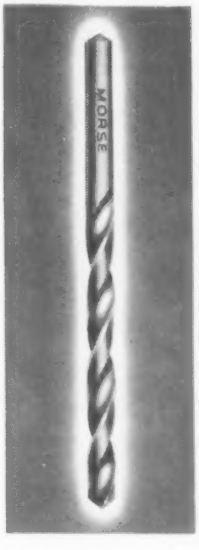
Illustrated are five special purpose drills that have supplied the answers to challenging problems by cutting *faster* and lasting *longer*. Perhaps one or more of them is designed for you. But remember, *your* production may vary enough to require seemingly similar but actually quite different specifications. That is why we say let Morse lend a hand in selecting the drill that will do the superior job for *you*. Your Industrial Supply Distributor will be glad to help.



MORSE **Quick-Twist Drills (1363)** . . . for deep-hole drilling in aluminum, magnesium, die-cast metals; for slate, marble and certain plastics.



MORSE **Cotter-Pin Drills (1386)** . . . for skin metal, shallow-hole drilling, cotter-pin holes, steering arms, knuckles, gas burners and copper. Ideal in portable drills.



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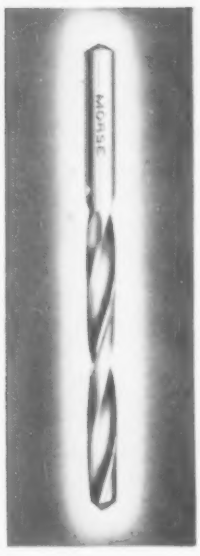

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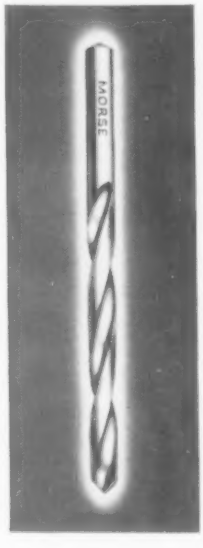

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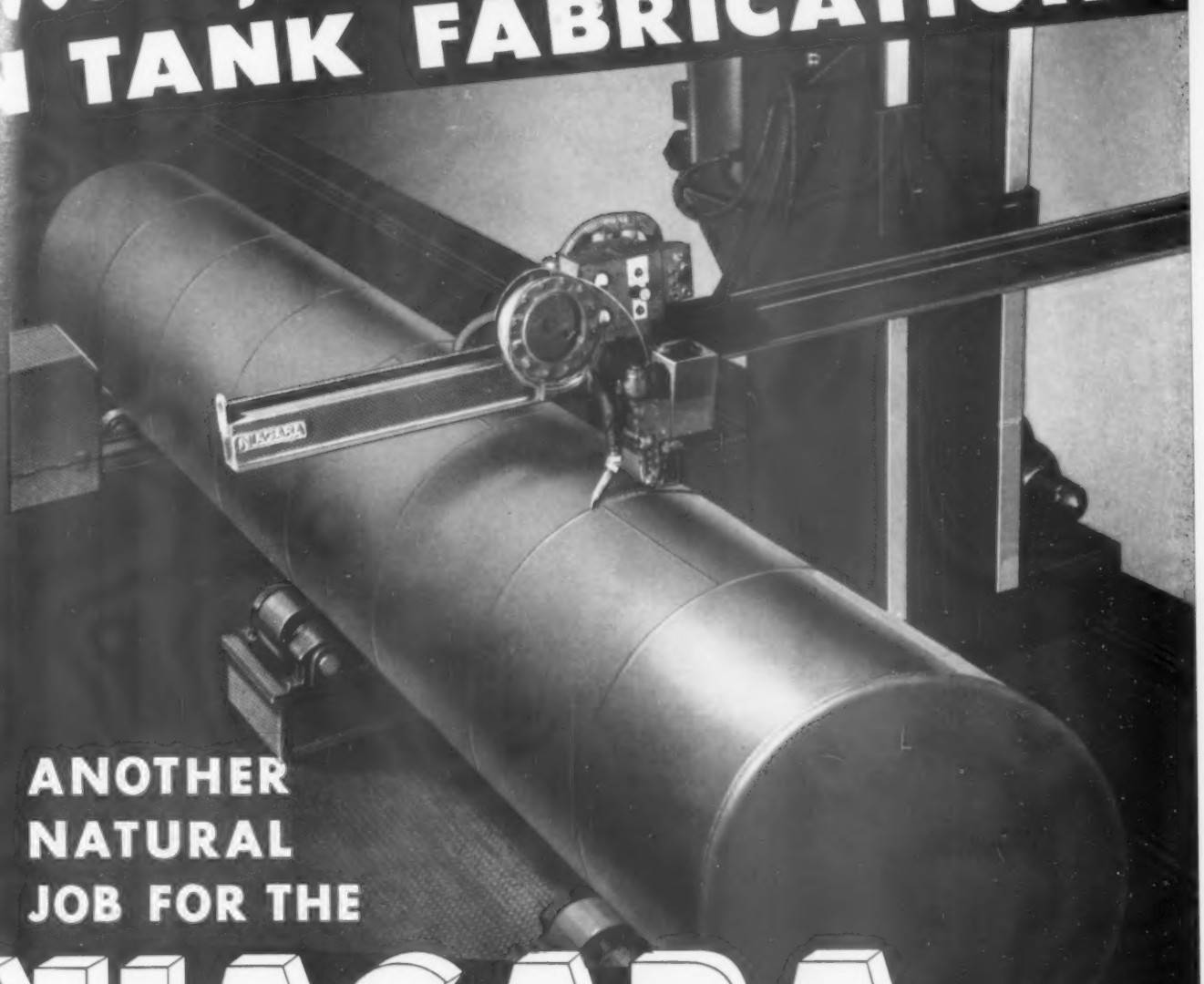

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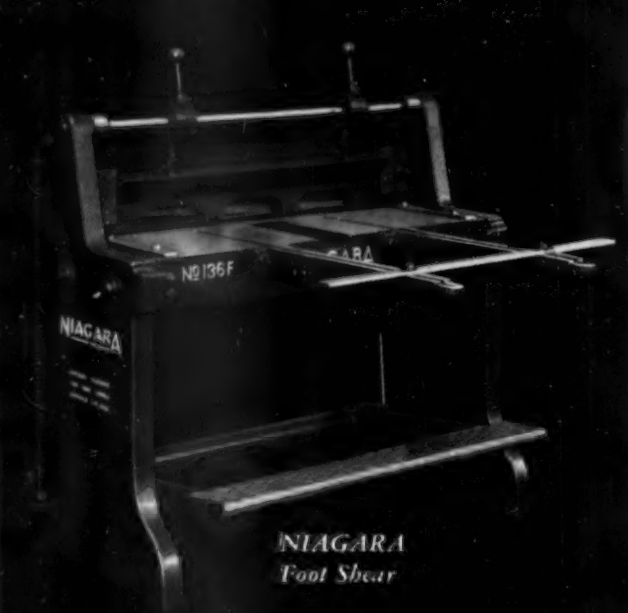

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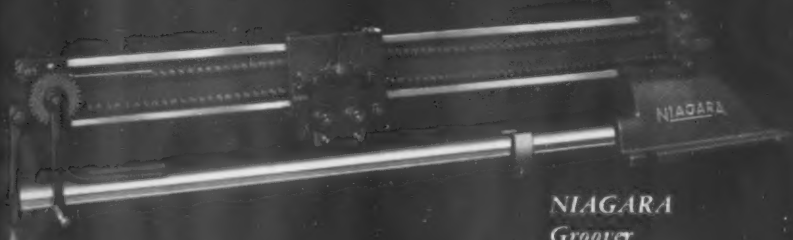

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What is Tool Engineering?

"WHAT IS TOOL ENGINEERING" is a question which has reached the stages of controversy even within the profession during the past few years. The evolution of tool engineering in itself has been responsible for confusion with regard to definition of a tool engineer and the scope of his profession.

Webster defines a tool as "an instrument of manual operation". This may have been accurate in the days of handicraft but it obviously is not broad enough to cover the term today. Industry has provided a more modern definition of a tool, describing it as "any device capable of working a material into a desired shape, holding it while it is being worked upon, or measuring it when the work has been completed". This definition includes the cutting tools, jigs, fixtures, dies and gages used in present day manufacture.

As industry has grown in complexity, however, the term "tool" has taken on a still more broad meaning. Not only are more complex machines included in the term, but in addition materials handling equipment, special processes such as plating or heat treating, and the arrangement of all these phases into a production plan comprise the function of today's tool engineer.

Tool engineering expanded its scope as industry developed because it became apparent that specific knowledge of all industrial facilities must be applied to manufacturing to obtain the maximum in production economy. The major function of tool engineering is to set up the most economical means of production under any individual set of conditions. In other words, more acceptable goods must be produced in a given time than in the past by using the best manufacturing methods and available equipment. In the performance of this function, all phases of production are covered, from the completion of the design of the product to its ultimate release, to production control as a workable product.

Halsey F. Owen, Chairman of ASTE's National Educational Committee, is professor of General Engineering, Purdue University.

Industry has long recognized the function of tool engineering and has practiced it to a greater or lesser degree. It has been known variously as production engineering, process engineering or tool engineering, the latter term being more commonly used than the others because of the manner in which it has evolved. The degree in which it was employed in industry was determined by the availability of personnel familiar with tool enginering and trained for it. There have never been enough tool engineers to fill the demand.

The initiation of the National Preparedness Program prior to the actual hositilities of World War II found industry sadly lacking in the means to produce war materiel on the scale that the program demanded. Actual hostilities accentuated this condition still further. It was the tool engineer who came forward at this time as the individual who could provide the know-how and ability to put production on the high plane required. It was largely through his efforts that the United States was able to win the production war and brought into the public eye as a profession, but as yet little

was known of its position or makeup.

To understand this function better, it seems necessary to analyze its various phases; in short, to see just what the duties of a tool engineer should be.

A product as designed by a product designer may or may not be capable of being produced with the existing facilities of a manufacturing plant. If it can be produced, it must be produced economically and the design may be such that it does not lend itself to economical production. The tool engineer with his background of shop experience and knowledge of shop equipment must determine whether the product can be made on existing equipment and, if so, what methods must be employed to manufacture it to best advantage. Frequently, he can make suggestions for changes in the design which will permit the product to be produced more rapidly and therefore more economically. Or he can make suggestions for changing the design so that it will be adapted to existing equipment in the plant.

When the design has been made satisfactorily, the tool engineer must determine the methods by which it may best be produced. This involves the selection of the tools to be used, the size and type of machine to do the work, and the proper sequence in which the various operations must be performed. This is called part or operation analysis and precedes all of the planning for production. It is in this phase that the most economical production of the device is determined. The selection of methods, tools and machines will determine the ultimate cost to produce the part and therefore must be considered with all th skill and experience the tool engineer has at hand.

As he specifies the tools to be used for any item, the tool engineer must have in mind the type of tool, its approximate

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cost and the time necessary to produce it. He is, therefore, in a position to give the tool designer some idea of what is required and to check the design as it progresses. He is also in a position to expedite the manufacture of the required tools and get them to production on time. Further, as the tools are received, they must be checked and tried to assure their proper functioning. If they do not perform their part as originally planned, he must recommend the necessary changes and corrections to make them function in a satisfactory manner. This is referred to as "working the bugs out" of the tools. It must necessarily be done before the tools can be put in production, otherwise the anticipated flow of production will be disturbed and the whole plan thrown out of phase.

In addition to checking the tools and methods, the tool engineer is responsible for the proper arrangement of the manufacturing equipment. He arranges the machines and material handling equipment so that handling of the product is reduced to a minimum, and delays between operations are eliminated. The various special processes must fit into this arrangement, too, and with the same restrictions of handling and delays. Only when this work is complete can the product be released to be manufactured in quantity.

It is evident from the foregoing that a large amount of experience and know-how go into obtaining economical production. It is even maintained that only by long years of experience can be an individual become a tool engineer. This has been true in the past, but at the present time it does not hold true. The need for tool engineers during the war and just preceding it was met in part by men already engaged in that type of work. Many others, however, were the product of educational courses and training programs set up by such agencies as the War Training Program, Training within Industry, and the War Manpower Board. The result of such programs was to produce an individual who, with a comparatively short period of practical shop experience, could take his place in the ranks of tool engineers.

The educational work thus started was later extended to vocational schools, technical institutes and the colleges. A number of vocational schools and technical institutes are offering two, three, and four year courses in tool engineering subjects. At the university level, considerable interest has also been shown. Here the more scientific approach to tool engineering subjects is stressed, and several universities are now offering courses of study in tool engineering subjects. Such courses as production planning, tool design, plant layout, and production control are included in the general scope of tool engineering and help to prepare the individual for entrance into this phase of the engineering profession.

In view of these considerations, it may be possible to arrive at a generally accepted definition of the term "Tool Engineering." At the risk of calling down much criticism both for and against, the following is offered: "The planning of the best methods, and the design and use of mechanical equipment for the economical production and assembly of manufactured parts of consumer goods." It would seem that this definition covers the subject in its major aspects, although there will be much disagreement on the matter.

The point is that until the members of the profession themselves agree on some definite area of activity, their professional standing is in question. It appears, therefore, that there is a need for education of the membership of the profession to establish a unity of thought with which to face their critics. It is with this thought in mind that this article has been written. The sincere consideration of the entire profession is directed to the answer to the question "What is Tool Engineering?" When the question is more clearly answered, the profession will have attained its mature stature in the professional world.

By Harold Chambers

PLAIN CARBON STEELS, ranging in carbon content from 0.7 to 1.5 per cent, are the most popular of tool steels, despite their less desirable physical properties as compared with alloyed grades. They tend to have lower wear resistance, lower hardenability, higher distortion during heat treatment, lower hot hardness, and either higher hardness with associated lower toughness or vice versa. Following are some of the common applications of carbon tool steels:

Carbon Content, %	Typical Applications
1.40-1.50	Engravers' tools, wire drawing dies
1.30-1.40	Files, lathe tools
1.20-1.30	Twist drills, stone planers
1.20-1.20	Taps, threading dies
1.00-1.10	Blanking and forming dies
0.90-1.00	Header dies, shear blades
0.80-0.90	Rivet sets, pneumatic chisels
0.70-0.80	Hammers, wedges

Most applications of tool steels are a compromise between toughness and wear resistance. Toughness is generally evaluated by resistance of a tool to chipping and breaking; wear resistance is evaluated by actual tool performance.

A distinction must be made, in evaluating tool performance, between wear resistance and hardness as determined in the usual way. Quench hardness is essentially a function of carbon content, and a fully quenched 0.7 per cent carbon steel will have a hardness equivalent to that of a 1.1 per cent steel similarly treated. The wear resistance is however, principally associated with the kind, amount and distribution of carbides present in the microstructure, and when properly heat treated, these factors are likewise a function of the carbon content. Thus the 1.1 per cent steel will, on the basis of wear resistance, give better performance than the 0.7 per cent grade, although on the basis of hardness alone they appear similar.

The nondeforming tool steels, which contain greater amounts of manganese (1.5 to 1.75 per cent), have a critical cooling rate low enough moderate sections may be fully hardened by oil quenching.

The high-speed steels contain substantial amounts of tungsten and lesser amounts of chromium, vanadium and sometimes molybdenum and cobalt. Their hot hardness properties are due to the high stability of the alloy carbides and the particle size of these carbides.

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A Guide to Tool Steel Selection

TABLE I—TOOL STEELS CLASSIFIED BY WEAR-TOUGHNESS RATIO

Each of the three groups arranged in order of increasing toughness and decreasing wear resistance. Figures indicated as max are optional and may be present up to amount noted. Since the difference in relative wear-toughness capacities of adjacent classes is small to negligible, the many brands covered by each class may be expected to give competitive performance except when very standardized operating conditions require that consideration be given to the footnotes.

Class	Conventional type names	Carbon	Manganese	Silicon	Tungsten	Chromium	Vanadium	Molybdenum	Cobalt	Nickel	Usual working hardness, Rockwell C[1]	Notes	Class
	Water-hardening steels												
1A	Tungsten finishing	1.25–1.50	0.15–0.35	0.15–0.50	2.50–6.00	1.80 max	0.30 max	0.50 max			63–67	A,B,C	1A
1B	Carbon or carbon-vanadium	1.30–1.45	0.15–0.35	0.15–0.35		0.35 max	0.30 max				63–67	A,C	1B
2A	High carbon, low tungsten	1.10–1.30	0.15–0.35	0.15–0.35	1.00–2.50	0.35 max	0.30 max	0.30 max			62–66	A,B	2A
2B	Low chromium or chrome-vanadium	1.10–1.30	0.15–0.35	0.15–0.35		0.10–1.20	0.30 max				61–66	A,C	2B
2C	Carbon or carbon-vanadium	1.10–1.30	0.15–0.35	0.15–0.35			0.30 max				61–66	A	2C
3A	High carbon, low tungsten	0.90–1.10	0.15–0.35	0.15–0.35	1.00–2.50	0.75 max	0.30 max				60–66	A,B,C	3A
3B	Low chromium or chrome-vanadium	0.90–1.10	0.15–0.35	0.15–0.35		0.10–1.50	0.30 max				58–66	A,C	3B
3C	Carbon or carbon-vanadium	0.90–1.10	0.15–0.35	0.15–0.50			0.50 max				56–66	A,D	3C
4A	Chrome-molybdenum or chrome-vanadium	0.55–0.90	0.15–0.35	0.15–0.35		0.40–1.20	0.35 max	0.25 max		0.50 max	55–64	A,C	4A
4B	Carbon or carbon-vanadium	0.70–0.90	0.15–0.35	0.15–0.35			0.30 max				53–64	A	4B
4C	Silico-manganese or silico-moybdenum	0.45–0.75	0.35–1.00	0.75–2.25		0.60 max	0.35 max	0.60 max			50–62	A,E	4C
	Oil-hardening and air-hardening steels (tools of intricate design)												
5A	High carbon, high chromium	1.80–2.50	0.15–1.20	0.15–1.00	2.00 max	10.50–14.00	1.25 max	0.30 max	1.00 max	1.00 max	58–65	A,F,G	5A
5B	High carbon, high chromium	1.80–2.40	0.15–0.60	0.15–0.50		10.50–14.00	1.20 max	0.70–1.00	0.60 max		58–64	A,F,G	5B
5C	High carbon, high chromium	1.30–1.70	0.15–0.60	0.15–0.50		10.50–14.00	1.20 max	0.50–1.25	4.00 max	1.00 max	58–63	A,F,G	5C
5D	High carbon, high chromium	1.10–1.40	0.15–1.20	0.15–1.10		5.00–13.00	0.75 max	0.70–1.50	0.60 max		58–63	A,F,G	5D
6A	Chrome-molybdenum	1.10–1.30	0.35–0.95	0.15–0.35		0.40–1.75		0.25–0.75			59–65	A,E	6A
6B	High carbon, low tungsten	1.10–1.30	0.15–0.70	0.15–0.35	1.00–2.50	0.25–1.25	0.30 max	0.30 max			59–65	A,B,C	6B
6C	Low chromium or chrome-vanadium	1.10–1.30	0.35–0.70	0.15–0.35		0.40–1.50	0.40 max				59–65	A,C	6C
7A	Cr-Mo, Mn-Cr, or Mn-Mo nondeforming	0.70–1.10	0.35–3.25	0.15–1.00		0.80–5.50	0.50 max	0.75–1.75			57–64	A,E	7A
7B	Chromium nondeforming	0.90–1.10	0.35–1.10	0.15–0.50	1.10 max	0.90–1.60	0.30 max	0.50 max			57–64	A,E	7B
7C	Manganese nondeforming	0.80–1.10	0.85–1.80	0.15–0.50	0.70 max	0.90 max	0.30 max	0.35 max			57–64	A,E	7C
8A	Low tungsten-chromium	0.40–0.65	0.15–0.35	0.15–1.50	0.75–3.00	0.50–2.00	0.50 max	0.35 max		1.50 max	50–62	A,E	8A
8B	Chrome-nickel or chrome-nickel-molybdenum	0.50–0.80	0.35–0.90	0.15–0.35		0.50–1.25	0.30 max	0.80 max		1.00–2.50	50–62	A,E	8B
8C	Chrome-molybdenum, chrome-vanadium, or manganese-molybdenum	0.50–0.90	0.15–0.90	0.15–0.50		1.20 max	0.35 max	0.40 max		0.50 max	50–62	A,E	8C
8D	Silico-molybdenum	0.45–0.70	0.35–1.25	0.75–2.25	0.50 max	0.75 max	0.60 max	0.15–2.20			50–62	A,E	8D
	High-speed (H.S.) steels and hot-work (H.W.) steels (tools which heat up)												
9A	Tungsten-cobalt H.S.	0.65–0.90	0.15–0.35	0.15–0.50	18.00–23.00	3.50–4.75	1.00–3.00	1.25 max	9.00–15.00		62–66	A,G,H	9A
9B	Tungsten-cobalt H.S.	0.65–0.90	0.15–0.35	0.15–0.50	17.00–21.00	3.50–4.75	1.00–2.50	1.25 max	5.00–9.00		62–66	A,G,H	9B
9C	Tungsten-cobalt H.S.	0.65–0.80	0.15–0.35	0.15–0.50	17.00–20.00	3.50–4.75	0.75–1.50	1.00 max	2.00–5.00		62–66	A,G,H	9C
9D	Tungsten-cobalt H.S.	0.65–0.85	0.15–0.35	0.15–0.50	12.00–15.00	3.50–4.75	1.00–2.25	0.75 max	3.00–8.00		62–66	A,G,H	9D
9E[2]	Molybdenum-cobalt H.S.	0.75–0.95	0.15–0.35	0.15–0.50	6.50 max	3.50–4.75	1.00–2.50	4.00–10.00	2.00–9.00		62–66	A,G,H	9E[2]
10A	18-4-4 and 18-4-3 H.S.	0.90–1.30	0.15–0.35	0.15–0.50	17.00–19.00	3.50–4.75	2.50–4.25	1.00 max			63–67	A,H	10A
10B	18-4-2 H.S.	0.75–0.90	0.15–0.35	0.15–0.50	17.00–19.00	3.50–4.75	1.50–2.50	1.00 max			62–66	A,H	10B
10C	18-4-1 H.S.	0.65–0.80	0.15–0.35	0.15–0.75	16.00–21.00	3.50–4.75	0.50–1.50	0.75 max			57–66	A,H	10C
10D	14-4-2 and 14-4-1 H.S.	0.55–0.80	0.15–0.35	0.15–0.50	13.00–15.00	3.50–4.75	0.75–2.25	0.75 max			57–66	A,H	10D
10E[2]	Mo-W or Mo-V H.S.	0.65–1.30	0.15–0.35	0.15–0.50	6.50 max	3.50–4.75	0.75–4.25	4.00–9.50			57–66	A,H	10E[2]
11A	Low carbon H.S.	0.25–0.60	0.15–0.35	0.15–0.35	16.00–19.00	3.00–4.50	0.30–1.25				35–59	A,H,I	11A
11B	High tungsten H.W.	0.25–0.60	0.15–0.35	0.15–0.35	12.00–16.00	2.50–4.50	0.75 max	2.50 max		3.00 max	35–59	A,H,I	11B
11C	Tungsten H.W.	0.25–0.50	0.15–0.35	0.15–0.35	8.00–12.00	1.25–3.50	0.60 max	1.00 max	2.00 max	2.25 max	32–55	A,H,I	11C
11D[2]	Mo, or Mo-W H.W.	0.30–0.65	0.15–0.35	0.15–1.75	3.00 max	2.00–5.50	1.25 max	2.50–9.00		1.75 max	32–59	A,H,I	11D[2]
11E	Tungsten-chromium H.W.	0.30–0.60	0.15–0.75	0.35–1.75	3.50–7.50	4.50–7.50	0.60 max	1.00 max	0.60 max	0.50 max	32–55	A,H,I	11E
12A	Chrome-molybdenum H.W.	0.30–0.60	0.15–1.25	0.80–1.35	1.75 max	4.00–7.50	0.50 max	0.45–3.00	0.60 max	2.00 max	32–55	A,H	12A
12B	Low tungsten-chromium H.W.	0.35–0.65	0.15–0.80	0.15–1.10	1.50–4.25	0.75–3.50	0.50 max	0.60 max		1.50 max	33–55	A,H	12B
12C	Chrome-molybdenum H.W. or chromium H.W.	0.30–1.00	0.15–0.75	0.15–0.75	1.00 max	2.25–4.50	1.00 max	1.00 max		0.50 max	33–55	A,H	12C
12D	Cr-Ni, or Cr-Ni-Mo H.W.	0.25–0.60	0.15–1.00	0.15–0.35		0.50–2.50	0.30 max	1.25 max		1.25–5.00	33–55	A,H	12D

A. Wear resistance increases and toughness decreases as carbon content increases.
B. Wear resistance increases and toughness decreases as tungsten content increases.
C. Hardenability increases, wear resistance increases, toughness decreases, movement in hardening decreases, and tendency for soft spots in hardening decreases as chromium increases.
D. Some special applications (silverware striking dies, certain header dies, etc.) may occasionally require extra penetration of hardness, which may be produced by adjusting manganese and silicon contents.
E. Hardenability increases, wear resistance increases, and toughness decreases as total alloy content increases.
F. Machining difficulties increase as total alloy content increases.
G. Red-hardness properties increase, and toughness decreases as cobalt content increases.
H. Red-hardness properties increase, and toughness decreases as total alloy content increases.
I. Water-cooling surface in operation, particularly when intermittent, tends to promote heat checking approximately in proportion to tungsten and/or molybdenum content.
[1]Not divided into classes. The relative position of a specific molybdenum steel is just below its tungsten steel counterpart. The tungsten counterpart is indicated by adding twice the molybdenum content to the tungsten in a molybdenum steel having 0.05 to 0.10% higher carbon than the tungsten steel.
[2]Once the minimum hardness for any steel in a given class is reached, it is time to change to an inherently tougher steel if the tool or die continues to chip, break, crumble, or heat-check as the case may be. Conversely, once the maximum hardness is reached, it is time to change to an inherently more wear-resisting steel, if operation is uneconomical because of high abrasion, or deformation as the case may be. Since the properties of the classes overlap to some degree, the change to a tougher steel is often made before the minimum hardness is reached, especially when the tougher steel is lower in price.

Results of Research on the Distribution of Heat Generated in Drilling

Some Thermal Aspects of Metal Cutting

By

A. O. Schmidt and J. R. Roubik

VIRTUALLY ALL OF THE energy expended in cutting metal is converted into heat which manifests itself in varying amount and degree in the chips, tool, and workpiece. The energy referred to is that required at the cutting tool and does not include that energy which is necessarily dissipated as mechanical and electrical losses in the machine transmission and drive. Heat generated in a cutting operation can be determined accurately with a calorimeter, and the measurements thus obtained permit computations of work, power, average chip temperatures, and tool forces (1).[1] Average temperature rises rather than localized, instantaneous temperatures are obtained with the calorimeter since these temperatures must be determined by heat-balance computations in which the temperature gradients that exist in the chips, workpiece, and tool during cutting and for some time after do not enter or are not considered. Power data, derived from torque and thrust measurements on a carefully calibrated dynamometer, are in close agreement with calorimetric determinations (1).

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It is generally accepted that the major portion of heat in a metal-cutting operation is generated in forming the chips and is carried away by them. Calorimetric tests of milling operations on steel at cutting speeds of 100 to 800 fpm indicate that the heat in the chips comprises 60 to 70 per cent of the total heat. However, since somewhat elaborate preparation and correction are needed with milling tests, simpler drilling tests were resorted to.

Measurement of Heat

In a series of drilling tests the amounts of heat in the chips, tool, and workpiece were measured separately. Three different calorimetric tests were used to measure: (a) total heat, (b) heat in the tool, and (c) heat in the chips (see Figs. 1, 2, and 3, respectively). A $^{7}/_{16}$-in. diam. drill with a 30-deg. helix angle, 118-deg. point angle, and 12-deg. relief angle was used in all tests. Test bars were made from a single piece of extruded Dowmetal, 0.375 in. in diam. A centrally located pilot hole 0.110 in. in diam. and $1^{1}/_{4}$ in. deep was machined in each bar. To insure uniform cutting conditions, each piece was countersunk at the top with a $^{7}/_{16}$-in. drill. All tests were performed on a Kearney & Trecker 2C Automatic precision boring machine with variable feeds and speeds.

At each of the following peripheral cutting speeds of 9.8, 49, 98, 147, 196, and 246 fpm., the drill was operated at feed rates of 0.0022, 0.0057, and 0.0091 in. per revolution (ipr). Distilled water at room temperature was measured into the calorimeter with a pipette. Water-temperature readings were taken immediately before cutting and after the drill had removed 1 in. from the length of the test bar. The total heat was measured by performing the drilling operation with the workpiece, chips, and tool submerged in water (see Fig. 1). The heat in the tool was determined by cutting an identical test bar dry and dropping the tool into the calorimeter immediately upon completion of cutting (see Fig. 2). Heat in the chips was obtained by noting the temperature rise of the calorimeter and water into which only the chips were permitted to fall (see Fig. 3). When drilling at 9.8 fpm, corrections for heat losses were made. At the higher cutting speeds the time of cutting was short and heat losses were within the reading errors. Measurements taken with this calorimetric arrangement become more accurate with a decrease in cutting time. In order to minimize heat losses at the low cutting speeds, such as at 100 rpm., (9.8 fpm.), the cutting time was decreased by ma-

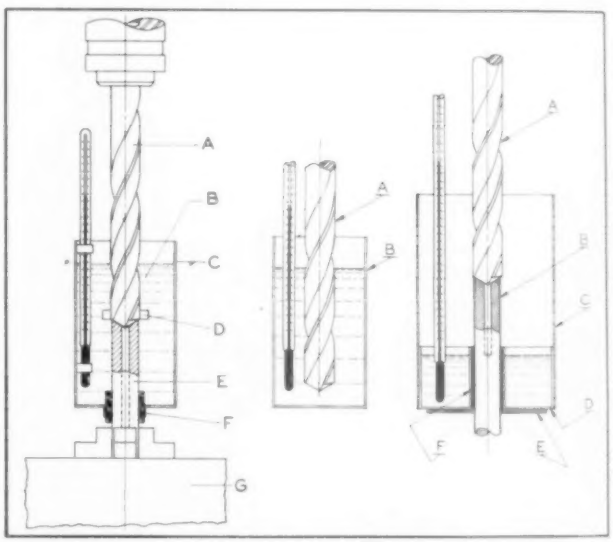

Fig. 1. Calorimetric Apparatus for Measuring Total Heat Generated in Drilling.
A, drill $^{7}/_{16}$ in. diam
B, 50 cc of water
C, container
D, blades on drill for agitation
E, $^{3}/_{8}$-in. test bar
F, rubber grommet
G, three-jaw chuck

Fig. 2. Measuring Heat in Tool after Cut
A, drill $^{7}/_{16}$ in. diam
B, container with 50 cc of water

Fig. 3. Measuring Heat in Chips
(Short chips resulting from brass point on drill fall into water.)
A, drill $^{7}/_{16}$ in. diam
B, $^{3}/_{8}$-in. test bar
C, chip guard made of cardboard
D, container with 50 cc of water
E, insulator
F, rubber grommet

[1] Numbers in parentheses refer to the Bibliography at the end of the paper. This article is based in part on a paper presented at the ASME Semi-Annual meeting, June, 1948.

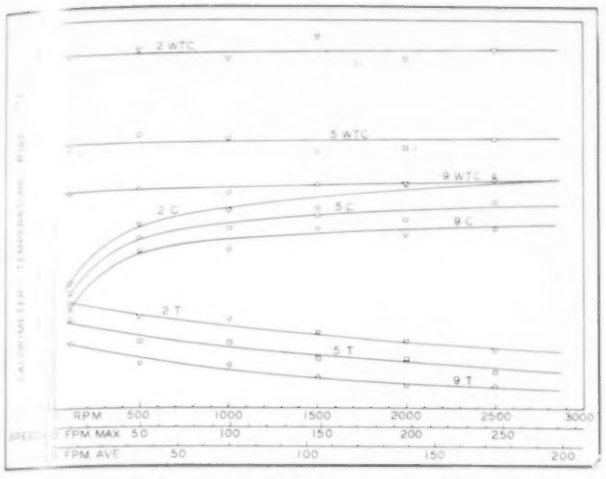

Fig. 4. Calorimeter Temperature Rise in Relation to Cutting Speed and Feed (2 WTC = heat in workpiece, tool, and chips at a feed of 0.0022 ipr, 2C = heat in chips at feed of 0.0022 ipr, 2T = heat in tool at feed of 0.0022 ipr. 5 and 9 denote feeds of 0.0057 and 0.0091 ipr, respectively. Average cutting speed is the speed on the mean diameter of the workpiece.)

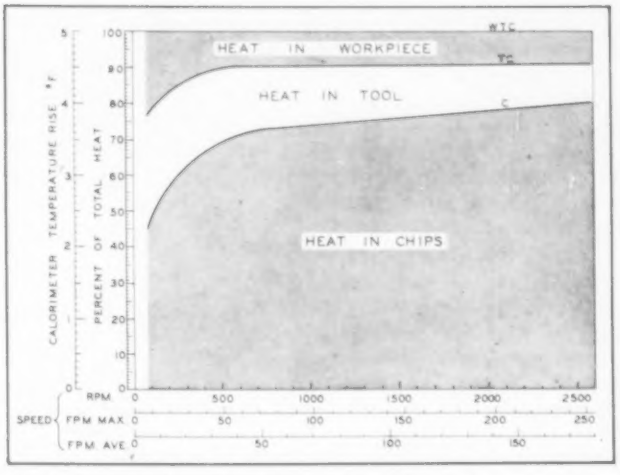

Fig. 5. Distribution of Heat in Workpiece, Tool, and Chips at Various Speeds (C, curve represents heat in chips; TC, curve represents total heat in tool and chips; WTC, curve (100 per cent) represents total heat in workpiece, tool, and chips, or simply total heat.)

chining only ½ in. of the workpiece material. The temperature values obtained in this manner were multiplied by two to give results equal to those that would be obtained in machining 1 in. of the test bar. This procedure was also resorted to in measuring the heat in the drill. Calorimetric temperature measurements in all cases are directly comparable since the different calorimeters were designed to have the same water equivalents. Therefore each calorimeter-temperature-rise value is a uniform, true index or measure of heat whether it be total heat, heat in the chips, or heat in the tool.

Comparison of Results

In previous, similar tests carried out with a dynamometer (5), when using only the cutting edge of a drill to machine a tubular test bar, no measurable difference in torque or thrust at the same feeds and speeds could be discerned whether the cutting was done dry or with the drill submerged in water or other coolants. The cutting speeds and feeds used in those tests were similar to the speeds and feeds mentioned in the foregoing report. Since no difference in torque or thrust, and, hence, no difference in work or power, could be found with a dynamometer between cutting dry and cutting with coolants, the values obtained with the calorimeter in measuring only the heat in the chips or the heat in the tool (cutting dry) should be directly comparable to those obtained in measuring the total heat (cutting under water).

Because in actual shop operations workpieces of similar dimensions are machined, it was thought more appropriate to choose a uniform length of test bar as a standard condition of these tests rather than a uniform period of cutting time. This choice also greatly simplified the experimental setup and apparatus, test procedure, and interpretation of data (6).

Generated Heat Constant

Data obtained in these tests are plotted in Fig. 4. These curves indicate that for any given chip thickness the total amount of heat generated and contained in the chips, workpiece, and tool, as measured with the calorimeter shown in Fig. 1 is practically constant regardless of cutting speed. It can be seen that greater amounts of heat occur with the finer chip thicknesses, whether the total heat, heat in the chips, heat in the tool, or heat in the workpiece be considered. Under the conditions of these tests higher average temperatures would of course accompany greater amounts of heat. Thus it may be said that at the same cutting speed, a fine feed will result in higher average chip, tool, and workpiece temperatures than will a heavier feed.

Above 1000 rpm. (69.4 fpm. average) the slopes of the curves indicating heat in the chips have a lower value, see Figs. 4 and 5. It may be expected that the ordinates of each of these curves will attain a different constant value at some higher speed, perhaps between 3000 and 3500 rpm. (208 and 243 fpm. average). It has been found that the temperature of milling chips, and therefore the heat in the chips, acquires a constant character above 200 to 250 fpm. cutting speed. Chip-temperature value of course depends on the material being cut, tool angles, and thickness of chip, but remains practically constant for any given set of the foregoing conditions regardless of cutting speed above 200 fpm. (2).

Chips Contain Most Heat

Data for a feed rate of 0.0091 ipr. have been plotted in Fig. 5 to show the percentages of heat in the chips, tool, and workpiece with the total heat taken as 100 per cent. In general, the chips contain the greatest proportion of the total heat with tool and workpiece following in that order. For the thicker chip the percentage of heat in the chips is greater, and the percentage of heat in both the tool and workpiece is less than it is for the thinner chip.

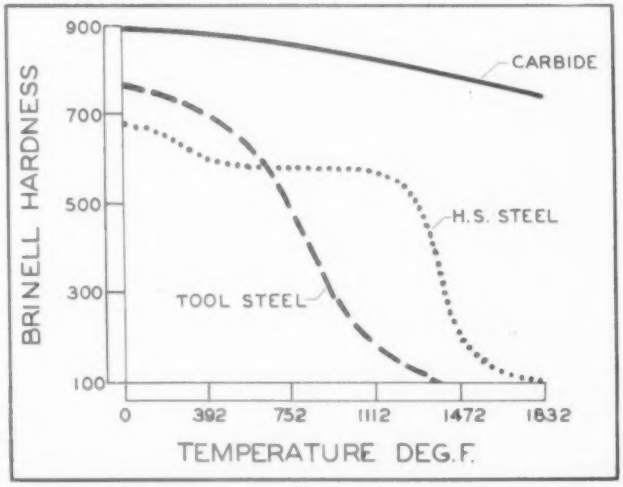

Fig. 6. Effect of Temperature upon the Hardness of Tool Materials (From E. Amman, see 8 in Bibliography.)

Several factors affect the heat distribution in any machining operation. Practically all of the mechanical energy is transformed into heat primarily by the deformation of the metal in the chip and to a lesser degree by the friction of the chip against the tool face. A very small portion of the mechanical energy is converted into cold work and is evidenced as strain in the machined surface to a depth of a few thousandths of an inch (4).

The amounts of heat that are conducted from the chip to the tool and workpiece depend upon the temperature differential between these elements, their masses, and the length of time in contact with one another. Heat lost to the surrounding atmosphere caused negligible error in these drill-test data because the time needed to complete most tests was of only a few seconds duration.

In view of the foregoing statements, it can be seen that data for the higher cutting speeds show greater amounts and percentages of heat in the chips because the heat has had less time to be conducted from the chip to the tool and workpiece. Thick chips have a lower average temperature than thin chips, Fig. 4, but the percentage of heat in the chips is greater for thicker chips. Because a thick chip has a greater mass and a lower temperature, the rate of conduction of heat away from a thick chip is less than it would be for a thin chip.

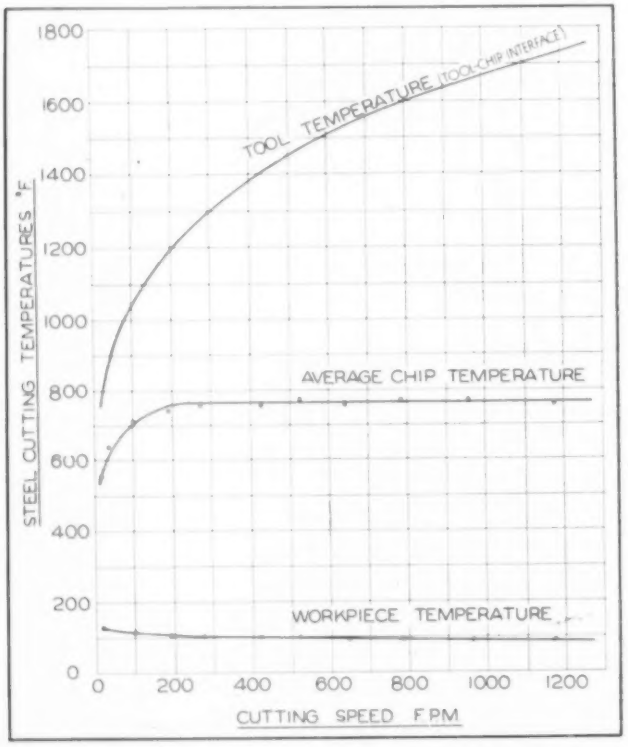

Fig. 7 Average Temperature in Milling of Steel Workpiece and Chips in Relation to Cutting Speed
(Feed per tooth 0.008 in.; depth of cut 0.125 in.; milling cutter with 6-deg negative radial rake angle. Chip temperatures measured with a calorimeter, surface temperatures of identical workpieces 1 in. diam and 2 in. long determined by Alnor low-range thermocouple. Each of foregoing values was determined with a keen cutting edge; tool wear will change cutting forces and therefore cutting temperatures also. Tool temperature based on tool-chip interface temperature measurements by Trigger.)

Chip Thickness vs. Temperature

In summary, thick chips mean less total work, lower average tool temperatures, and lower workpiece temperatures (3). Higher cutting speeds neither increase nor decrease greatly the work per volume of material machined when cutting conditions and tool remain identical. Of course higher cutting speeds would increase power requirements since

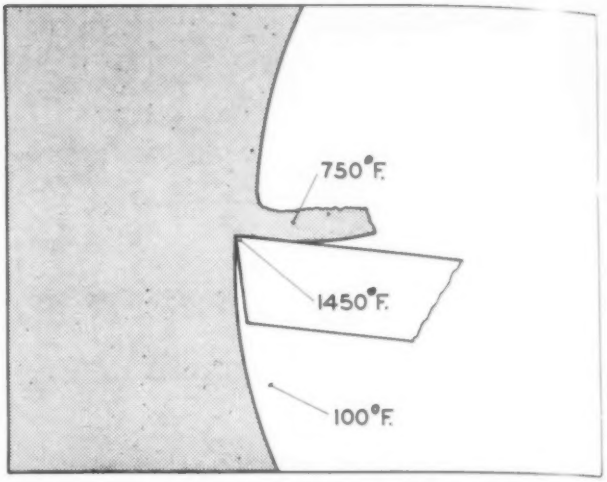

Fig. 8. Diagram of Temperatures in Steel Cutting at 400 fpm Cutting Speed. Temperatures of workpiece (100 deg F) and chip (750 deg F) taken from Fig. 7. Tool tip temperature (1450 deg F) based on toll-chip interface temperature measurements by Trigger.

equal amounts of work would be done in shorter time intervals. As cutting speeds increase up to about 200 fpm., they entail higher chip temperatures and lower workpiece temperatures. Above 200 fpm. chip temperatures remain practically constant. Generally, tool temperatures will increase, however, if machining is continuous or prolonged, or the cutting speed is increased, since the heat in the tool will accumulate faster than it can be dissipated in most instances. For the same reason the heat in the tool will be concentrated near the cutting edge and the temperature of this portion of the tool will be considerably higher than surrounding portions. Higher cutting speed especially will tend to accentuate this condition. Chip thickness is limited by the strength of the tool, surface-finish requirements, and setup and machine limitations. Cutting speed is often limited by the ability of the tool to conduct heat away from the immediate vicinity of the cutting edge.

When only the lips of a drill are used to cut a tubular test bar the action is similar to machining with a single-point tool and therefore can be considered related to machining accomplished in planer, lathe, and many milling-machine operations (5).

If constant cutting time had been used as the basis of comparison, the trends of the average chip and workpiece temperature as given in this report would remain unchanged. However, the average tool temperature would increase with increasing feed and speed as indicated in Fig. 7. This result must be expected since more chip material will rub against the tool face in a given period of time with either an increase in feed or an increase in speed.

Tool Tip Temperature

The actual temperature reached during the cutting operation by the tool tip itself, that is, by the cutting edge and the immediately surrounding tool material, is of primary interest because the ability of the tool edge to stand up will decrease with increasing temperatures. See Fig. 6. It has frquently been observed from a comparison of chip temper colors that the temperature of the chip on the side away from the tool was higher than on the side which rubs against the tool. Also, it frequently has been observed that the temper color of the chip on the rough surface away from the tool was formed before the temper color on the shiny surface which has rubbed against the tool face. This would indicate that the heat on the rough side was more intense than the heat on the shiny side and actually caused a rise in the temperature of the shiny side to a value high enough to produce a temper color after the heat has had time to flow

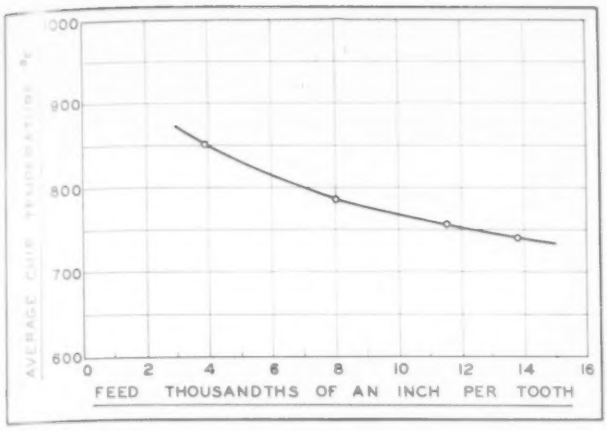

Fig. 9. Effect of Feed on Average Chip Temperature
(These chip temperatures were measured with a calorimeter when machining 1-in. diam test bars of SAE 1055, normalized steel, with a 2-in. diam face-mill which had two tungsten-carbide tips of 6-deg negative radial rake. Depth of cut 0.125 in., speed 265 fpm. The curve pictured will remain approximately the same at higher speeds.

through the width of the chip. For example, the temper colors on chips of SAE 1020 steel, 180 Bhn., removed at a cutting speed of 450 fpm. and a feed per tooth of 0.020 in. with a milling cutter having 0 deg. axial rake, 6 deg. neg. x 0.030 in. primary and 30 deg. pos. secondary radial rake, and 15 deg. corner angle, indicated 500 F. on the rough side and 450 F. on the shiny side. These temper colors may not provide an accurate method of temperature measurement under these conditions, but the comparison of chip temper colors may be used in determining that one temperature is lower than another.

Temperature of Work Piece

Temperature of the steel workpiece and chips measured in milling are plotted in Fig. 7. The tool temperatures in this graph are based on data arrived at by Professor Trigger, of the University of Illinois, in tests with a tool-workpiece thermocouple arrangement (8). See also Fig. 8. Typical average chip temperatures as affected by feed are plotted in Fig. 9.

Summary

The major portion of the heat generated in a metal-cutting operation is carried away by the chips.

Under 200 fpm cutting speed the percentage of heat in the chips will vary with cutting speed and chip thickness; the higher the cutting speed and the thicker the chip, the higher will be the percentage of heat in the chips. Above a cutting speed of 200 fpm the amount of heat in the chips, and also the average chip temperature, acquire a constant character for otherwise identical cutting conditions.

At low cutting speeds (around 10 fpm) the amount of heat in the chips will be about 40 to 50 per cent of the total heat generated, depending upon the chip thickness.

At higher cutting speeds (200 fpm and above) the amount of heat in the chips will vary between 60 and 80 per cent of the total heat generated, depending upon the chip thickness. The remaining heat is distributed almost equally to the tool and workpiece. Since the workpiece is usually of larger mass than the tool, its temperature will be low while the heat in the tool is of necessity concentrated in a zone near the cutting edge which at high cutting speeds or under continuous machining will reach a high temperature. This is a frequent contributing cause of tool failure.

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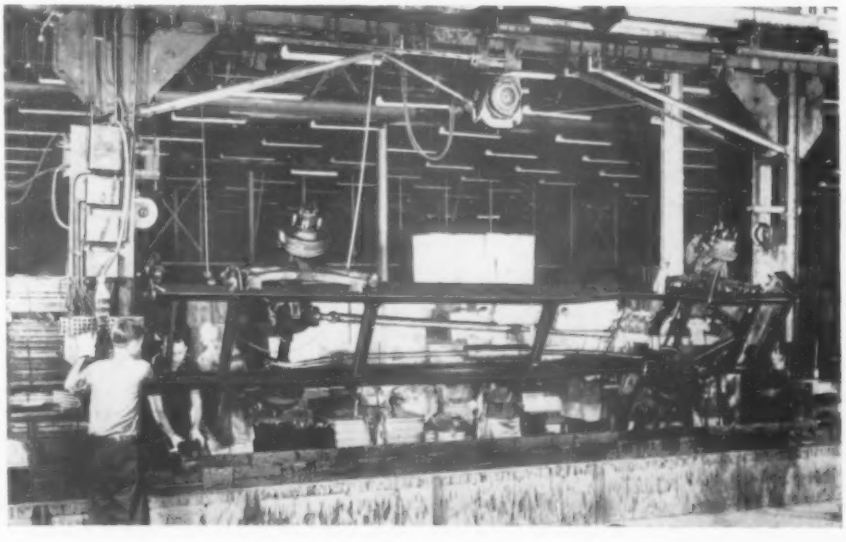
"Roll-Over" Truck Frames

At the new Studebaker truck plant, frames of all sizes are turned right side up with a minimum of physical effort, as they proceed along the chassis assembly line, by means of a motor-actuated trunnion fixture. The fixture is further adapted to various lengths of frames by motor-driven screws which expand or contract it to suit a particular chassis.

Up to this point the frames are conveyed upside-down to facilitate assembly of axles and drive units. The fixture, which travels both ways over the moving conveyor, is set over the frame, clamped and raised by means of a central electric hoist, turned over by a motor driven unit and set back on the conveyor. All controls are handled by the operator shown at the left.



09-54000

Application of Industrial Diamonds

By E. A. Ryden

CONTRARY TO THE popular belief that diamonds are primarily highly-priced and prized gems, their major use is in industry; in fact, more than 75 per cent of all diamonds are diverted to industrial uses, as material for hard abrasives and lapping compounds, cutting tools and drawing dies.

The first form of diamond to be used in industry was the carbon, also known as the "black diamond" and the "Carbonado." It is only found in Brazil and, because of its structure, can be readily broken into smaller sizes. There is no regular shape, nor does it have planes of cleavage. While still having important uses, the carbons have been largely superseded by the crystallized diamonds.

There is also a crystallized, roundish form of industrial diamond known as "Ballas"—derived from "ball"—whose crystallization may be compared to the layers of a pearl except that it lacks the foreign nucleus of the pearl. The layers of a Ballas cannot be removed except by abrasion and this takes place in the course of industrial use as the diamond is consumed. A scarce commodity, the Ballas is very tough because of its crystalline system, but is equally tough to process into tools if it must be shaped in any way.

However, the crystallized diamond comprises the vast bulk of industrial as well as gem diamonds. In their most ideal shape they can be identified by their octahedral or dodecahedral forms although, in a minor number of cases, they also come as cubes. Basically, however, they are all octahedrons or agglomerations of octahedrons, and the majority of diamonds by weight are so far from the ideal shape as to be quite unsymmetrical. Regardless of shape, however, all crystallized diamonds have the same cleavage planes. In fact, a large percentage of diamonds—particularly those from the Congo—have no identifiable shapes whatsoever; yet, as long as they have protrusions and are not too badly flawed, they are valuable as cutting or abrading tools of one kind or another.

Applications of Diamonds

When a diamond is too poor in quality to be shaped into a strong tool—that is, if it lacks natural points or if too full of imperfections to stand up as an abrasive unit—it is crushed into diamond powder or dust. Diamonds in this category are usually known as "crushing boart."

While spelled and pronounced in various ways, the term "Boart" has been applied, through generations, to diamonds not suitable for cutting into gems. As used today, the term applies to industrial diamonds that are only good for crushing into abrasive powder, graded for such uses as lapping other diamonds or hard metals or, more so, for bonding into wheels, saws or tools for many applications.

Because the bulk of industrial diamonds are "boarts" crushed into powders of varying degrees of fineness, the major end use is the impregnation of resinous or metallic or vitreous wheels. These are either of flat surface type, for lapping, or with an impregnated periphery. In the latter case, the wheels may be so thin as to be virtually blades, hence, must be made of metal. The resinous wheel is mainly used for lapping, especially of hard-metal tools and dies.

Composite photograph of diamonds at work. 1, a diamond wheel grinding a carbide tool; 2, diamond tool used to finish bore piston pin holes; 3, 4 and 5, respectively, diamond dressing of an abrasive wheel and a single-point and cluster-type dressing tool. 6 shows an incandescent lamp whose filaments of fine wire, 7, are drawn through diamond dies, 8. 9 is a diamond core-bit, and 10, 11, 17 and 18, in that order, the drilling rig, the actual drilling, cores or rock strata, core drilling operation for oil, and the derrick. Shown at 12 is a cylindrical part being turned with a diamond tool; and at 13, tools for shaping of plastics parts. 14 and 15 are removable diamond sawing lugs, and 16 shows stone sawing with a diamond saw.

Inset and bonded into a holder, either as a single-point tool or in clusters, they are used as cutting or shaping tools for various substances, and for dressing and truing of abrasive wheels. In the latter capacity they may be used manually, or with automatic devices, for sizing of parts being ground, for the forming of wheel shapes and contours, notably for such applications as the shaping of wheels for thread grinding. In such application their economy is apparent since the diamond can be reset to present a new point should any one of the points become dulled.

While the brittle nature of the diamond precludes its use for removal of considerable depths of stock, it is nevertheless admirably suited to fine finishing operations, such as diamond boring or turning. The hardest known substance and one of the most resistant to heat, its use permits the high surface speeds which, combined with fine feed, produces a mirror-like surface finish together with close dimensional control. In addition to metals, the diamond also permits shaping and cutting of plastics and ceramics which would preclude use of ordinary cutting materials.

Perhaps one of the most important uses, if not the most sensational, to which diamonds are put, is core-drilling through the earth's strata for oil and minerals. The core-bits used for such drilling is produced in the form of a crown with a hollow center; this, "trepanning" earth or rock formation in the process of drilling, permits samples to be brought up from subterranean depths and analyzed for composition. And these are but a few of the many uses to which industrial diamonds may be put.

This article is based on information furnished by the Industrial Diamond Association of America, Inc.

By A. E. Rylander

34-76000

Metal Spraying—A Modern Production Process

Spraying provides for uniform application of metal to both metallic and non-metallic parts

METAL SPRAYING—or metallizing, as it is known by one of its trade names—is a process whereby atomized metal is sprayed onto a surface to which, if it has been properly prepared, it becomes firmly bonded. Like welding, it can be used to build up worn or under-sized parts which may be restored to original dimensions by subsequent machining. Unlike welding, however, which can only be used to join or surface metallic components, metal spraying permits metal to be bonded to non-metallic objects, ceramics included.

It has the advantage, over welding, that thickness of application can be closely controlled and of such uniformity that parts sprayed may be ground to size without prior machining. Thus, worn machine ways, shafts, bearings, cylinders and pistons that have been worn in service may be metal-sprayed and restored to normal dimensions and usefulness—to all practical purposes as good as new.

Method of operation is rather simple and is closely comparable to paint spraying, about the only difference being that the paint is replaced by a coil of wire. Wire is automatically fed through a burner—a gas-air mixture—where it melts as rapidly as fed. A blast of air then blows the atomized spray through a nozzle, to be impinged onto and bonded into the part or object being sprayed. The "workings" can be clearly visualized by referring to the diagram of a typical spray gun, shown in Fig. 1, and the cut-away view in Fig. 2. Fig. 3 is a section through metals bonded together by metal-spraying.

One application of metal-spraying, which is finding a growing use throughout industry, is the metal-coating of wood patterns. Such processing not only seals the pores of the wood against moisture, with its recurrent swelling and shrinkage and eventual cracking, but also protects the surface during handling in the foundry and while in storage.

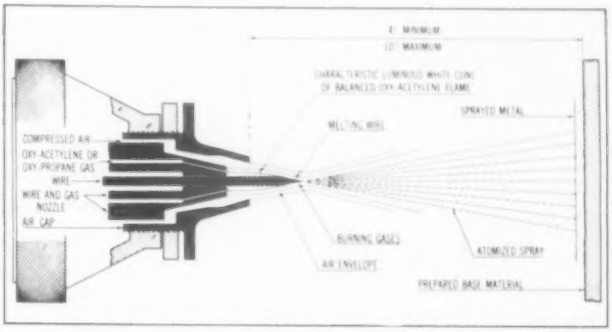
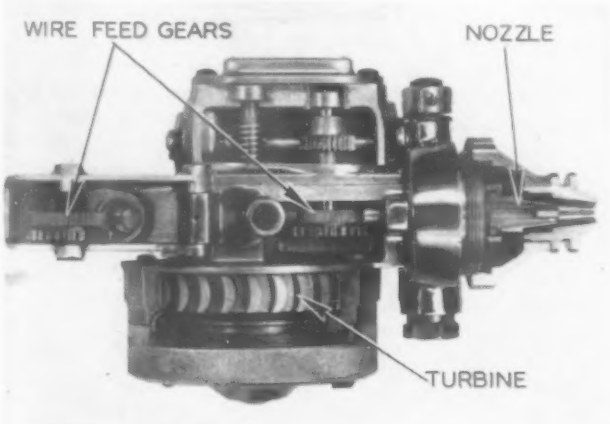


Fig. 1. A diagram cross-section of a "Metco" metallizing gun, showing wire nozzle and air cap. The operation is so clearly indicated in the diagram that further description is not necessary. Illustration by courtesy of Metallizing Engineering Company, Long Island City, N. Y.

For such spraying, about the only requirement is that the surface of the pattern be clean and dry.

A closely similar use is the metal-spraying of forming dies made from any of the several plastic, resinous or low-melting alloys. So applied, the surfaces of such dies may be hard-faced and their useful life greatly extended. Furthermore, the sprayed surface may be given a higher and more enduring surface finish than is ordinarily possible with the base compound. In turn, this results in a comparatively superior surface finish on parts formed in the dies.

Yet another use is the metal-spraying of building columns and even the walls of buildings—an application patly compared to paint spraying. In this connection, a building subjected to acid or other corrosive fumes may be sprayed with non-corrosive metals. Also, machines—or their com-



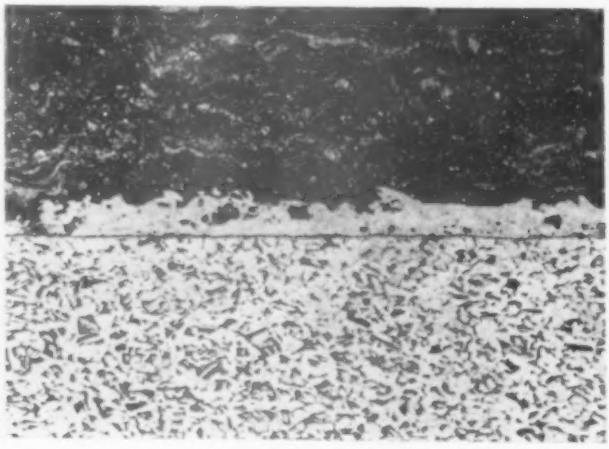


Fig. 2, a cut-away view of a Metco metal-spraying gun, showing the inner mechanism. The wire is fed by means of corrugated rolls through to the nozzle, where it is atomized. A turbine provides the air pressure necessary for impinging the atomized metal onto the part or object being sprayed. Heat for melting the wire is generated by a gas-air mixture in the nozzle of the gun. Fig. 3, at right, shows a section through a bar in which 0.10 carbon steel—the dark section—has been sprayed onto mild steel. The latter has first been treated with a "Spra-Bond" to insure a good bond between the base and built-on metals.

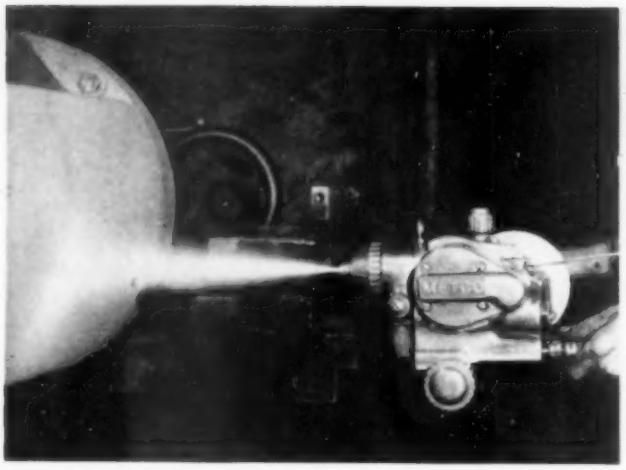


Fig. 4, at left, shows a metal-spraying gun spraying metal onto a lithograph roll, and Fig. 5, at left, shows stainless steel being sprayed onto a locomotive booster ball. This photograph was taken at the shops of the Minneapolis, St. Paul and Saulte Ste. Marie Railroad.

ponents—made of ferrous metals that would rust when exposed to acid fumes, salt spray or other corrosive elements may be sprayed with brass, copper, monel or other non-rusting metals.

While essentially designed for manual operation, as may be inferred from the nature of the equipment, metal spraying can be applied mechanically—and, for that matter, automatically. Thus, one may set up a shaft or cylinder in a lathe and spray on the metal while the part is rotating, as suggested in Figs. 4, 5 and 6. The "gun" may be secured to the lathe carriage and fed at a rate to insure a uniform layer of sprayed metal. Sections that have been subjected to wear may require a number of passes to conform with adjacent diameters, after which one or more layers may be sprayed on to provide machining or grinding stock.

It should not be inferred, from the foregoing, that metal spraying is a repair or maintenance process only, however well it may be suited to such work. It is also a production "tool" in every sense of the word, and may be used for metal-surfacing parts on a mass scale. Under such conditions, one naturally inclines toward automatic setups, whether for rotating or reciprocating applications.

Thus, one may "metallize" surfaces of parts, made of wood or other material that might ordinarily be covered with a metallic foil or even painted, with the expectation that the surface would have a greater comparative endurance. Or, as previously implied, one may spray non-corrosive coatings, on a production basis, onto ferrous parts that would ordinarily rust when exposed to the elements.

There is, of course, the matter of preparation. But then, one would not attempt to paint a surface unless it were clean, nor would one attempt to galvanize or electro-plate materials that had not been previously degreased, acid-cleaned and washed. Nor, for that matter, would one ordinarily attempt to weld broken parts together without some prior preparation.

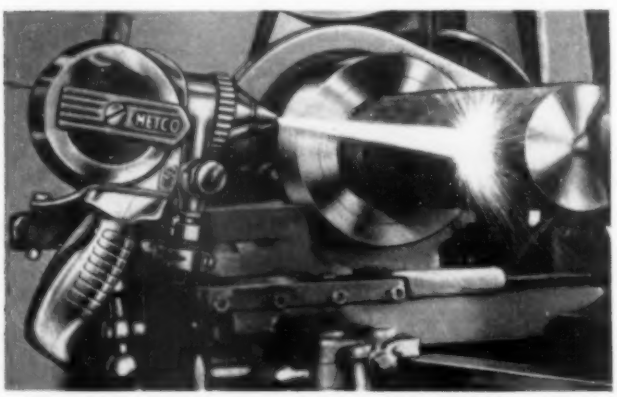


Fig. 6 shows how round parts may be set up in a lathe, for metal spraying. The "gun" is mounted on the lathe carriage and may be power-traversed, for uniform application of the sprayed-on metal. Rate of feed would be proportionate to the pounds-per-hour capacity of the spraying unit. All illustrations by courtesy of Metallurging Engineering Company, Long Island City, N. Y.

While necessary for good bonding, the actual preparation of surfaces for metal-spraying is rather simple. For one thing, the surface must be entirely free from grease, wax, paint or plastic coatings that would tend to seal the surface pores. In addition, the surface should be grit or sand-blasted, using a sharp abrasive only so as to insure a roughened surface.

Round parts, such as shafts, should be given a rough turning in a lathe—or a rough cut in a shaper or planer if the surface is flat—with a feed rate comparable to that of not-too-fine threading. This is done for the purpose of providing pores or crevices into which the sprayed metal may be firmly locked and bonded; consequently, the rougher or more "chattery" the cut, the better the bond. Naturally, no such roughing is necessary on ceramic products which are naturally porous and therefore provide a good bond. Where metal is to be sprayed on hardened parts—and assuming that these have a comparatively smooth service—an electric bonding method is resorted to, and this is said to have been proven entirely practical and satisfactory.

We have, then, surface preparation, application of the sprayed-on metal, and subsequent finishing to consider, in the order stated. As previously implied, parts that have been metal-coated or resurfaced may be finish ground to desired size without prior machining—such as turning, milling or planing—provided that the dimensions have not been increased to a point where grinding alone is not economical. In most cases, perhaps, a prior machining operation down to grinding size may be preferable but not mandatory.

Since rates of application should be of interest, these follow. Thus, mild and carbon steels, and stainless, may be applied at rates from 8½ to 22 lbs. per hour; bronze, brass and copper from about 13½ to 37 lbs.; monel and nickel from 8½ to 18 lbs.; aluminum, from 7 to 18 lbs.; zinc, from 30 to 55 lbs.; and lead up to 100 lbs., all for the smaller spraying units. Iron seems to be the slowest to apply, ranging around 7 lbs. per hour.

The above rates, from which averages may be taken, are based on the use of ⅛ in. wire and the following pressures: Acetylene 15 p.s.i.; oxygen 17 p.s.i.; and air 50 p.s.i. These pressures are recommended by at least one prominent maker of metal spraying to produce a coating of highest quality. However, higher rates of application can be attained with increased pressures.

By [illegible] W. Lengbridge

34-92000

Redrawing Operations on Circular and Rectangular Shells

Installment No. 6 of a Series on the Theory and Practice of Pressing Aluminum

Whether or not the first draw is a limit draw, the fact remains that any cold work on the metal increases its resistance to further cold work. Consequently, the reductions in the second and successive draws must be less than that used for the first draw because, with each operation, the metal loses some of its plasticity. Hence, a descending scale of reductions should be used for blanks requiring two or more draws.

If, for instance, it is required to make a 4¾ in. diameter shell from a 12 in. diameter blank—a total reduction of 60½%—it would be better to make a first draw of 45%, and a second of 28%, rather than two draws of equal reduction. This would mean that the greatest reduction would be made on the soft blank, which is high in plasticity. The first draw would cold-work the metal to some extent,

TABLE 3. REDUCTION DATA FOR TYPICAL SHELLS—UTENSILS

Item	Description	Alcan Alloy	Blank Size Dia.	Thickness, in.	Reduction	t/D	Suggested Reduction
72021	Exper. Test	Spec.	5⅛	.028	49%	.55%	
7852	Percolator	3S-0	14	.020	46	.14	38%
5562	Percolator	3S-0	13¾	.025	45	.19	40
8	Cone	3S-0	10¾	.032	45	.30	40
42	Tea Pot	2S-0	13	.045	44	.34	
05561	Percolator	3S-0	10½	.023	43	.22	40
1872	Whist. Ket.	3S-0	11¾	.018	43	.16	40
	Sap Pail	2S-0	22	.028	43	.13	38

Table 3 lists data on the first draw of several well established items being made at Aluminum Goods Limited, Toronto. Some have been produced annually for 25 years or more, others are comparatively new items and include utensils made from Alcan 2S and 3S alloys ranging in thickness from .016 to .064 in.

The reduction percentages shown are quite satisfactory on those items having a substantial t/D ratio, but it is interesting that those having low t/D ratios are perennial trouble items which often take days to get into production. These could be improved by using the lower reduction percentages suggested in the last column of the table.

The dies for many of the deep thin-walled shells are hardened tool steel, whereas most of the dies for those shells which give the least trouble are made from cast iron. In spite of the advantages obtained with hardened tool-steel dies, however, the deep thin-walled shells are more difficult to draw than shells with a higher t/D ratio.

TABLE 4 DEEP DRAWING REDUCTION SCALE

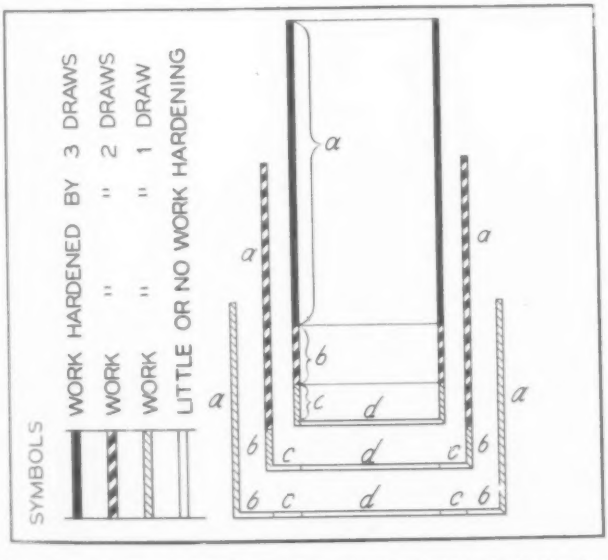
1st Draw	Redraws			Total
From Blank	2nd Draw	3rd Draw	4th Draw	Reduction
35%	20%	15%	10%	60%
40	23	18	13	67½
45	27	22	16	73½
48	30	25	18	77½

making a second draw of the same reduction percentage quite difficult, but, it would still be plastic enough to take a second draw of a lower reduction percentage, involving less cold work. Tables 3 and 4 may be used as a general guide in selecting a scale of reductions for redrawing non-heat-treatable aluminum alloys.

The total reduction, referred to in Table 4, is not the sum of the reductions of all the draws. Rather, the reduction per operation is calculated from blank to 1st draw, from 1st draw to 2nd draw, and so on, with the total reduction calculated from the blank diameter direct to the finished shell diameter. A typical example is shown in Fig. 45.

Because of increased strain-hardening with each draw, a point must eventually be reached when the metal becomes too hard for further cold work. At this point, it is necessary to anneal the shell to restore its plasticity, after which further cold work can be applied. The total reduction possible between anneals depends on the work-hardening rate of the metal, and the nature of the work being done. Compared with other metals, aluminum is capable of more cold work between anneals.

In high quality deep drawing steel, for example, 67% reduction between anneals is possible, providing the metal is fully annealed to start with, is low in carbon and drawn in dies with suitable clearance, draw radii and lubricant. Most stainless steels strain-harden rapidly, and total reduction between anneals seldom exceeds 50%. Draws on this metal must be planned with care because, the greater the reduc-



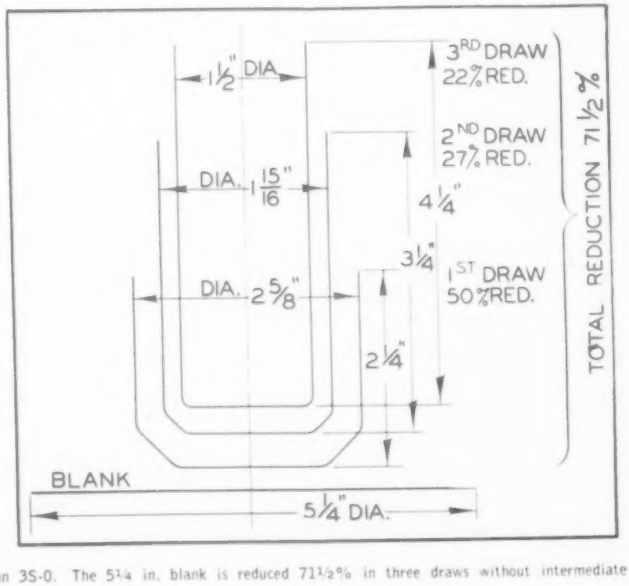
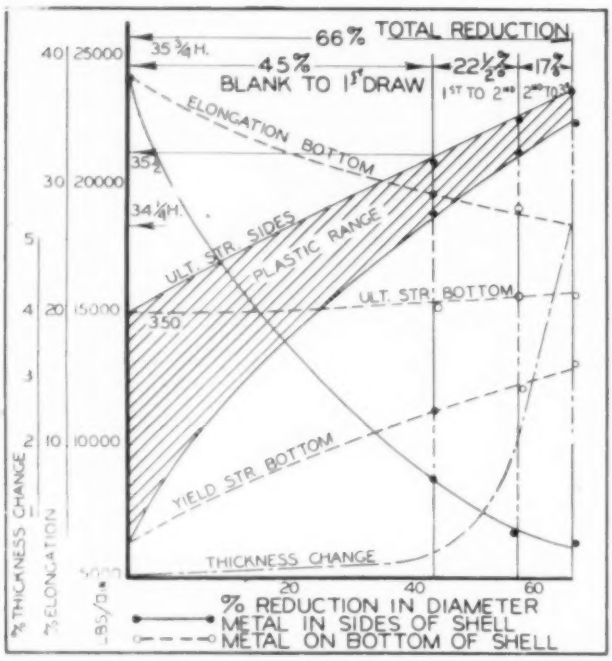


Fig. 45, at left, shows a typical reduction arrangement for a circular shell made of Alcan 3S-0. The 5¼ in. blank is reduced 71½% in three draws without intermediate anneals. The reduction stated is not necessarily maximum for this alloy.

Fig. 46, at right, illustrates three draws on a shell, with hardness zones in each indicated by letters a, b, c and d. Zone "a" is cold-worked in all three draws; "b" in two draws, "c" in one draw; and zone "d" given little if any cold work. If the third operation shell were tested before annealing, the metal in zone "a" would be found harder than metal in zones "b" and "c", while metal in zone "d" would differ but little, in temper, from the original blank. Specifically, the increase in hardness is proportional to the cold work done and, as hardness increases, ductility and plasticity decrease.



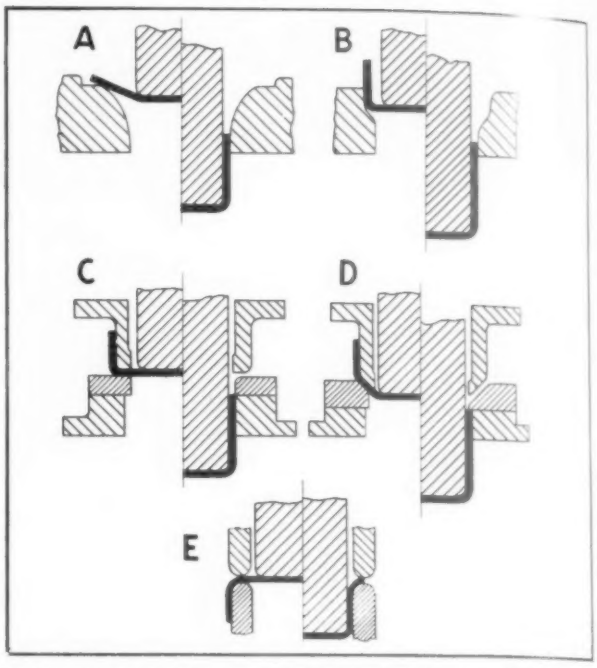


Fig. 47, at left, shows the effect of drawing on the mechanical properties of Alcan 3S-O. The chart is based on a light-gauge percolator produced in three draws from a 15 in. diameter x 0.020 in. thick blank. The blank and sections of each draw were tested for ultimate and yield strength, elongation, and other properties, and the results plotted against the reduction percentage as shown. Fig. 48, at right, shows redrawing operations on circular shells. "A" indicates a single-action draw and "B" a redraw of the same shell. In these two cases, it is assumed that the t/D (thickness-diameter) ratio and the reductions are such that the draws may be made without a blankholder. "C" and "D" show two types of double-action redraws, the one with a flat-nosed blankholder, the other with a 45° angle on the nose. The latter design provides the easier path for metal movement. At "E" is shown a reverse draw which is useful in certain cases. In this type of operation, the metal is literally turned inside-out and, although it is flexed twice, the flexing is all in one direction and perhaps less severe on the metal.

tion, the more need to relieve stresses by annealing in order to guard against cracking. This stress relieving should be done shortly after drawing.

Aluminum to be deep drawn can be given more than the maximum total reduction shown in Table 4—possibly as much as 85% or more—without need of annealing. However, ironing is a factor which may lower this because any drawing operation in which ironing is also done will naturally strain-harden the metal more rapidly than would a free-drawing operation.

Anneals, when necessary, depend also on the thickness—diameter ratio, and while 67% may be the limiting point on one gauge, it may be too high for a thinner material used for the same shell. Nor can it be assumed that the same amount of cold work can be given to the shell between all anneals. There are other factors, such as variation in grain structure due to varying amounts of cold work in different parts of the shell, which have a definite bearing on the cold-working of the metal.

The annealing of a shell should, theoretically, permit starting again at the maximum reduction. However, this is seldom possible for the following reasons: Certain areas, in a shell which has been given several draws, will not have been cold-worked as much as other areas, and this variation will result in a variation in grain size after annealing. That part of a shell which has received the most cold work will, on annealing, recrystallize to a smaller and more uniform grain size than those parts which have received less cold work. See Fig. 46.

Change in Properties Due to Redrawing

In order to determine the effect of drawing on the mechanical properties of sheet metal, a test was made on a light-gauge percolator produced in three draws from a 15 in. diameter x 0.020 in. thick Alcan 3S-O blank, as shown in Fig. 47. Results of a later test were quite consistent with the first. The change in the properties of the metal in these tests may be summarized as follows:

(1) Ultimate strength: The rate of change in ultimate strength is more or less constant for all draws, and amounted to 9% on the side metal, and 1¾% on the bottom, for each 10% reduction in diameter. The total change was a 60% increase for a total reduction of 66%.

(2) Yield strength and elongation: The maximum change in yield strength and elongation occurred in the first reduction. Here, the increase in yield strength was 36% on the side metal, 14½% on the bottom for each 10% reduction of the first draw, and tapered off to 6% on the succeeding draws. The total change was an increase of 220% for a total reduction of 66%. The rates of change in elongation followed a similar scale. This difference in the rate of change between the ultimate and yield strength narrows the plastic range and explains the need for a reducing scale of reductions for redrawing operations.

(3) Thickness: The maximum change in thickness occurred in the redrawing operation in the upper side wall area and amounted in total to about 5%.

(4) Zone maximum change: In all cases, the test results were about 10% higher in strength and lower in elongation in the upper side wall section than in the lower half of the shells, and the maximum thickness change occurred there also. This seems logical considering that this upper area received more cold work than any other part of the shell, and consequently, should show the greatest change in properties.

(5) Direction of grain: Tests taken with and across the metal grain showed values about 3% higher in the former case.

Until recently, press work has been more or less a shop science, but tests such as the foregoing suggest that a fund of useful data could be compiled from a study of the process.

Blankholding Methods

A few typical redrawing operations on both single and double-action presses, shown in Fig. 48, illustrate the method of blankholder control in redrawing. The "before" and "after" arrangements are shown on each side of the center line. In both cases, the metal is flexed in two directions, giving it considerable cold work. This added bending and

friction load, together with the fact that the metal has already been hardened by the first draw and therefore made more difficult to move, is a good reason for using smaller reductions with each redraw.

Redrawing Rectangular Shells

In the foregoing, we have been dealing with circular shells. Redrawing rectangular and unsymmetrical shells present many more difficulties, particularly when the corner radius is relatively small. Fig. 49 shows, at A, B and C, the corner layout of rectangular shells of equal length, width, and depth, but with different corner radii.

It will be noted that the radius of the first operation on shell B is not struck from the same point as the radius of the finished shell. There is good reason for this. When discussing *Metal Flow*, it was stated that the corner metal is drawn, and that the side metal is bent to shape. This means that considerable metal movement takes place in the corner area and, in order to assist this movement, the amount of metal made to flow must be kept to a minimum.

The reductions for rectangular and irregular shapes are not as easy to calculate as circular shells, but as the corner radii of rectangular shells—ends of ovals, and so on—become relatively large, they may come close to the percentages used for round shells. A shop rule states that "if the depth of a rectangular shell exceeds four to six times the corner radii, it should not be attempted in one draw."

On square shells, it is sometimes possible to use round blanks, and even make the first draw in the form of a circular shell. In the succeeding redraws, the square shape is approached gradually, as shown in Fig. 50, which is a square radio shield $2\frac{1}{4}$ in. by 4 in. deep.

Redrawing Tapered and Domed Shells

The main factor which determines the number of drawing operations, necessary to shape a flat blank into a hollow shell, is the difference between the diameters of the blank and the shell. The amount which a blank may be reduced in diameter in each draw is governed to a large extent by the plasticity of the metal. When drawing tapered or domed shells from certain metal, the contour of the shell is another factor which affects both the number of operations necessary to obtain the shape, as well as the amount by which it may be reduced in each redrawing operation.

Draws in which substantial areas are out of control, require greater blankholding pressure to prevent puckering, as suggested by Fig. 36, A, B and C, Installment No. 4, September, The Tool Engineer. Higher pressures subject the metal to greater tensile stresses.

High-strength metals are able to withstand these stresses better than low strength metals, and this fact makes it necessary to use different methods when shaping tapered and domed shells from strong metals like stainless steel, than when shaping these contours from comparatively low-strength metals like aluminum.

Strong metals will permit the use of draw beads or high blankholding pressures without fractures occurring, and because of this, these contours can be drawn in fewer operations on these metals than is possible when using aluminum. The methods used to obtain tapered and domed contours, to be described, refer particularly to the non-heat-treatable alloys of aluminum. The heat-treatable alloys of aluminum may require a similar procedure, but to a lesser degree.

It has been previously stated, in this series, that shells requiring several draws should be given the largest reduction in the first draw, with subsequent drawing operations being given progressively smaller reductions. This applies particularly to straight-sided shells in which practically all the sidewall metal is reduced in each operation. Tapered or domed shells should be reduced in such a manner that the reduction steps will lie along the contour of the finished shell. Fig. 51 shows the operation arrangement on three shells of the same diameter and depth, but with different contours, as explained in the caption.

Although these three shells are all the same diameter and depth, they will require blanks of different sizes because the area in the various contours is different. As the arrangement at A is typical of shells in which most of the wall metal is reduced in each operation, a reducing scale of reductions should be used. If the tapered shell shown at B was drawn in the same number of operations as shell A, puckering would probably occur because of a lack of complete control of the metal, as suggested by B-1. In order to avoid this condition of poor control, extra draws would be necessary in order to locate the metal so that the contour line of the finished shell would cut through the redraw steps, B-2.

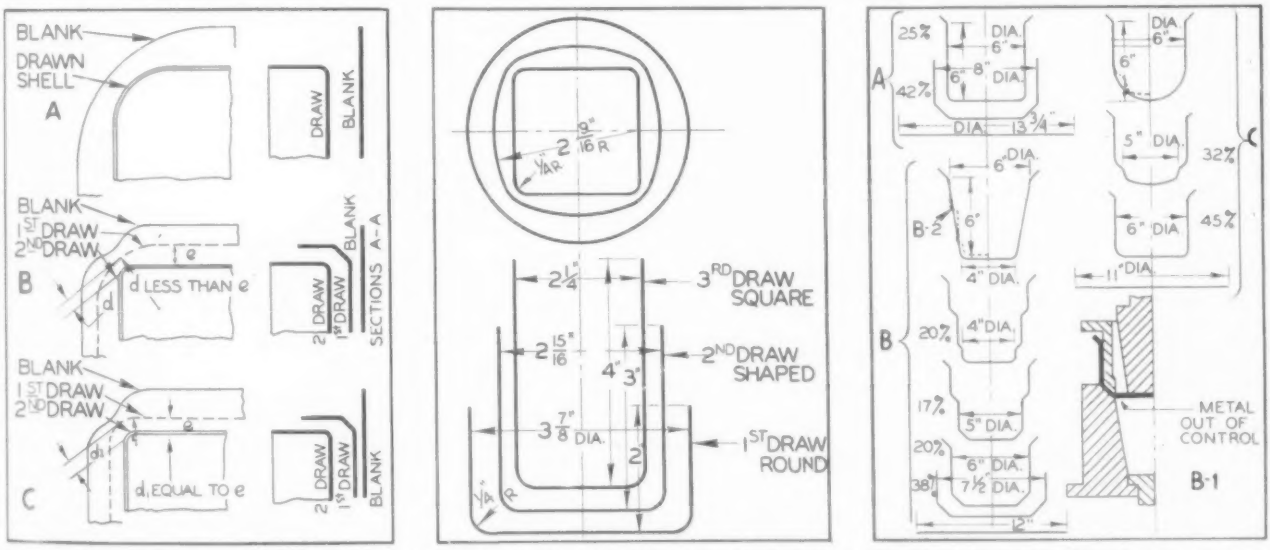
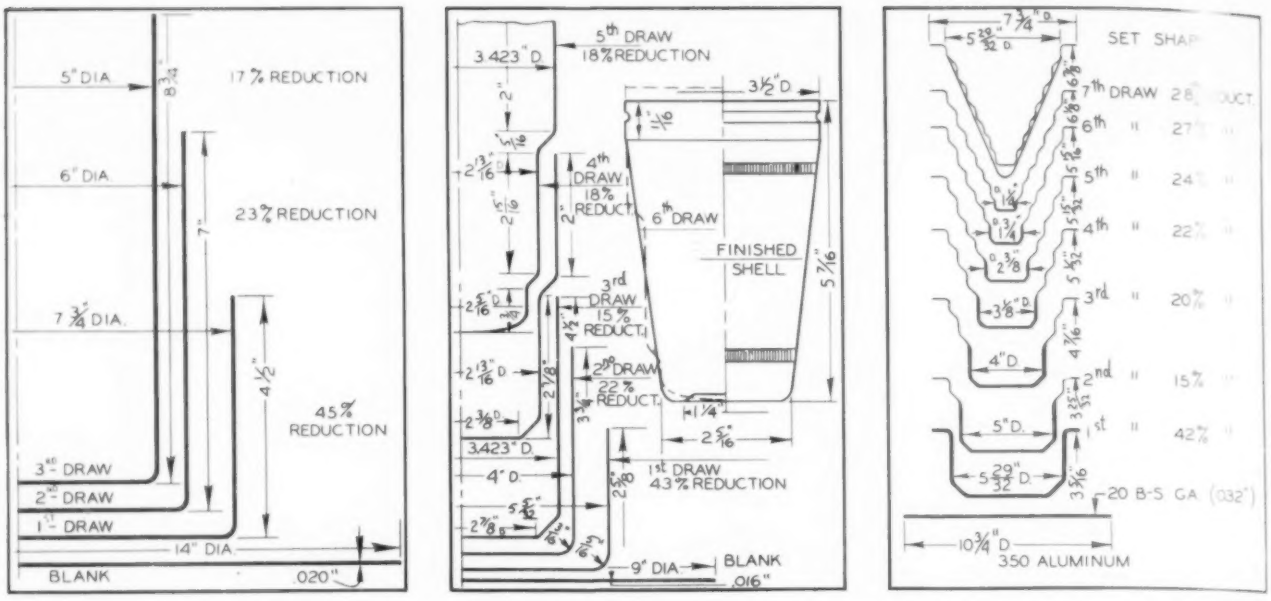


Fig. 49, at left, shows—at A and B—the corner layout of two rectangular shells of equal length, width and depth, but with different corner radii. This difference necessitates a difference in the shape of the blank and, because the radius of Shell B is so small in relation to its depth, two draws would be necessary, for this shell, whereas Shell A would present no difficulty in one draw despite that the size and thickness of the two shells are identical. If shells B and C are compared, it will be seen that, in B, distance "d" is less than "e", and this represents good design for rectangular draws. In C, distances "d" and "e" are equal—presenting a condition of maximum flow at the corner. This would lead to drawing troubles in production. The smaller the distance between the first and second operation shells through the corner, the better; and this distance need only be sufficient to give blankholder strength at this point. On square shells, it is sometimes possible to use round blanks and even to make the first draw circular. The square shape is approached gradually, as suggested by the $2\frac{1}{4}$ in. x 4 in. deep square radio shield shown in Fig. 50, center. Fig. 51, at right, shows shell contours—a factor in determining the number of draws. A represents a straight-sided shell 6 in. dia. x 6 in. deep drawn in two draws from a $13\frac{3}{4}$ in. dia. blank. B is a tapered shell, also 6 x 6 in., drawn in five draws from a 12 in. dia. blank. The domed shell, C, is also 6 x 6 in., but drawn in three draws from a blank 11 in. in diameter.



Figs. 52, 53 and 54, left to right, are typical examples of redrawing arrangements taken from actual production jobs. Fig. 52 shows the shell used in the test discussed in the text and results plotted in Fig. 47. An additional draw would make this job less troublesome. Fig. 53 illustrates need for extra operations because of the contour. In spite of favorable conditions, the tapered shell requires more operations than the straight shell because of the tapered side walls. Fig. 54 shows a pointed cone representing a maximum tapered shape as discussed in the text.

Some material will be outside the contour line and some inside—that is, there will be too much material in the outer band, which will have to be reduced, and not enough in the inner band, which will have to be stretched in order to form the stopped contour to a tapered contour. In the final operation, the reduction steps will be straightened out, and excess metal in the outer band will supply the shortage in the inner band. If the steps are balanced on each side of the contour line, the reduction of the outer band will not be excessively puckered, nor will the stretching of the inner band result in splitting.

It is extremely difficult, however, to obtain a perfectly smooth-walled shell from this stepped contour, and shells of this shape usually require a lathe ironing operation in order to remove the slight ripples or puckers which remain. In addition, because of the high tensile stresses to which the stretched area may be subjected, high quality deep-drawing metal is essential for draws of such shapes. Too few steps, in drawing tapered shapes, involve excessive metal movement at the steps, and increase the tendency to wrinkle or split.

In domed shapes, a similar procedure is necessary for the same reason as for tapered shapes. The steps may be angular as used for the shell B, in Fig. 51, or blending radii as used for shell C. In all such cases, the diameter which each redrawing operation must give to the shell should come close to the contour of the finished shell. If the depth of the metal drawn in at each step is substantial, the reduction factor must be given more consideration, and the reduction percentages kept within safe limits. If, on the other hand, the depth of each step is small as at C, the reduction percentage per step may be increased, because the amount of metal being made to flow is small.

Figs. 52, 53 and 54 show several examples of redrawing arrangements taken from actual production jobs. They will serve as a general guide to procedure in drawing and redrawing straight-walled tapered and domed shapes from aluminum. Fig. 52 is a sketch diagram of the operation arrangement for the shell used in the test, as previously described and with results plotted on the chart, Fig. 47. The thickness-diameter ratio is low and, although it is produced in three draws, an additional draw would make this job less troublesome.

Actually, this particular shell has always been a difficult one to produce without a lot of nursing. The t/D percentage is 0.14, and the reductions are 45, 23 and 17 per cent, making a total reduction of 68%. A better arrangement would be four reductions—36, 20, 17 and 17% respectively.

Fig. 53 illustrates the need for extra operations because of the contour. The t/D ratio is 0.18, and the total reduction 61 per cent. In other words, the t/D% is greater and the total reduction is less. In spite of these favorable conditions, however, the tapered shell requires more operations than the straight shell because of the existence of tapered side walls.

Tapered shells are difficult shapes to draw and, as the taper angle increases, the number of operations necessary to make them increases also. Drawing problems of this kind require very careful analysis and good tooling. When surface finish of the product is important, these shapes often require lathe burnishing after drawing for a satisfactory finish.

Fig. 54 shows a pointed cone representing a maximum tapered shape. Although the taper on this shell is more severe than that shown in Fig. 53, it is not as difficult to draw because the depth of each step is quite shallow, and the amount of metal being made to flow at each step is small. The shell in Fig. 54, however, emphasizes a point mentioned earlier, that the contour of the shell determines the amount by which it may be reduced in each redrawing operation.

The reductions in this shell are on an increasing scale after the third draw, and they cannot be otherwise because the tapered contour determines the difference in the diameter of the progressive step. The shallowness of each draw makes it possible to exceed normal reduction values considerably. If the metal was all drawn in at each step, the reduction percentages of 24, 27 and 28%, in the 5th, 6th and 7th operations, would be out of the question.

The total reduction at the last step on this cone-shaped shell is about 88%, but this does not represent a severe case of work-hardening, because only a small portion of the wall is reduced at each step. On the other hand, if all the metal has been drawn in at each step, the work hardening effect would have been quite severe. The heavy outlines in the various draws in Fig. 54 indicate the metal which is being worked in the various operations. The metal is moved in each operation, so that all the steps lie along the shell contour, and in a final setting operation, the steps are straightened out to the contour required.

Installment No. 7 will follow in December issue, *The Tool Engineer*

By O. H. Somers

34-64000

Tools for Dimensional Quality Control

The ideal condition, in manufacture, must be compromised with the fact of variability

It can be stated as a truism that if a machine process should call for parts exactly 0.250 in. in diameter, and if these parts were to be processed in a perfect machine, then all pieces produced would measure exactly 0.250 in. and no other size. However, this ideal situation is never met with in practice, since any practical machine will produce a majority of pieces to the specified dimension although many will be slightly over or under this nominal dimension.

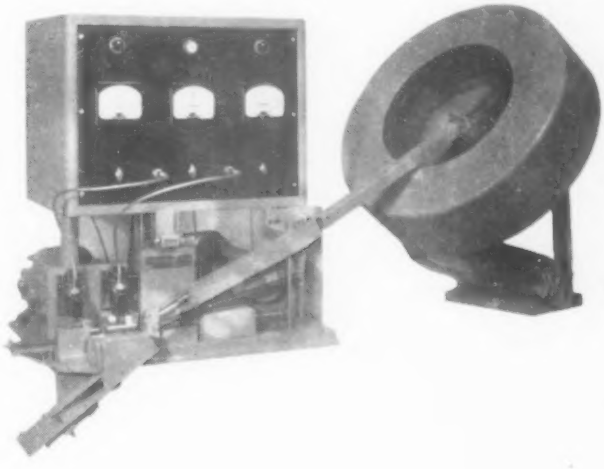
This characteristic of variability in machines actually appears in two forms. One of these may be properly described as natural or pure chance variability, the other as unnatural or assignable variability.

As a pat example, take the tossing of a coin. If the coin is honest, a series of tosses will show an irregular pattern of heads and tails. In the long run, about the same number of heads will appear as tails, but forecasting a particular toss is pure guesswork. This pattern is therefore pure chance or natural variability.

But if a coin having two heads be tossed, only heads would turn up, and even if the existence of two heads were not known in advance, one would soon suspect a form of variability other than pure chance. And this would be unnatural or assignable variability since the reason for its occurrence is assignable to some unnatural cause which can be determined.

In a more complex sense, all machine processes possess these two essential forms of variability. Normal looseness in machine parts, minor variations in material size or hardness, tool wear and other factors all contribute in a natural or pure chance way to produce parts varying in size. For this reason, one assigns tolerances to manufactured parts.

Unnatural or assignable variations occur for significantly different reasons. Abnormal machine looseness, extreme variation in material size or hardness, errors in machine setting, tool slippage or tool breakdown may unexpectedly result in marked variations in the size of a part. In any event, the causes are unnatural and may be discovered and corrected. It has been shown that, provided that only natural or chance causes are operating, all machine processes produce qualities of parts which always vary in size according to a general curve shown in Fig. 1. This statement is always true regardless of the type of machine or process in question. It was further shown that a change in a process due to unnatural or assignable causes does not normally change the shape of this curve. It only shifted its location, as shown in Fig. 2.



An important item, in dimensional control, is the tools used for inspection. Shown here is an automatic measuring and sorting machine, by Arlin Products, Inc., Detroit, designed to automatically sort valve guides into "good" and "bad," based on a simultaneous measurement of outside and inside diameters. Operating speed is said to be 4500 pieces per hour.

The fact that an assignable cause shifts the natural pattern of variability, but does not usually change its shape, leads to this conclusion: That an average of five successive samples, from any process operating under natural or pure chance variability, will almost always fall within what may be termed "upper and lower control limits."

If an unnatural or assignable source of variability appears in the operation, this fact will be disclosed promptly by the plotting of such averages because many of them will fall outside of the control limits. As an example, consider the chart shown in Fig. 3, each point of which shows the averages of

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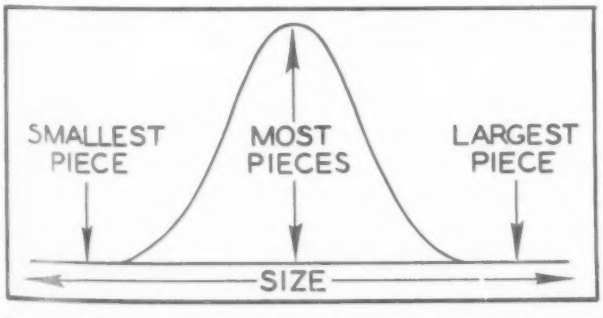
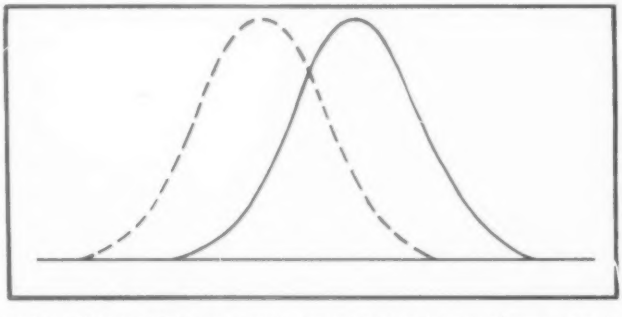
This article is a condensation of a paper by Mr. Somers, who is Director of Sales at Rack Engineering Co., Pittsburgh, Pa.





Provided that only natural or chance causes are operating, all machine processes produce quantities of parts which always vary in size according to the general curve shown in Fig. 1, at left. This statement is always true, regardless of the type of machine or process in question. However, change in the process due to an unnatural or assignable cause does not materially change the shape of this curve. It only shifts its position, as shown in Fig. 2, at left.

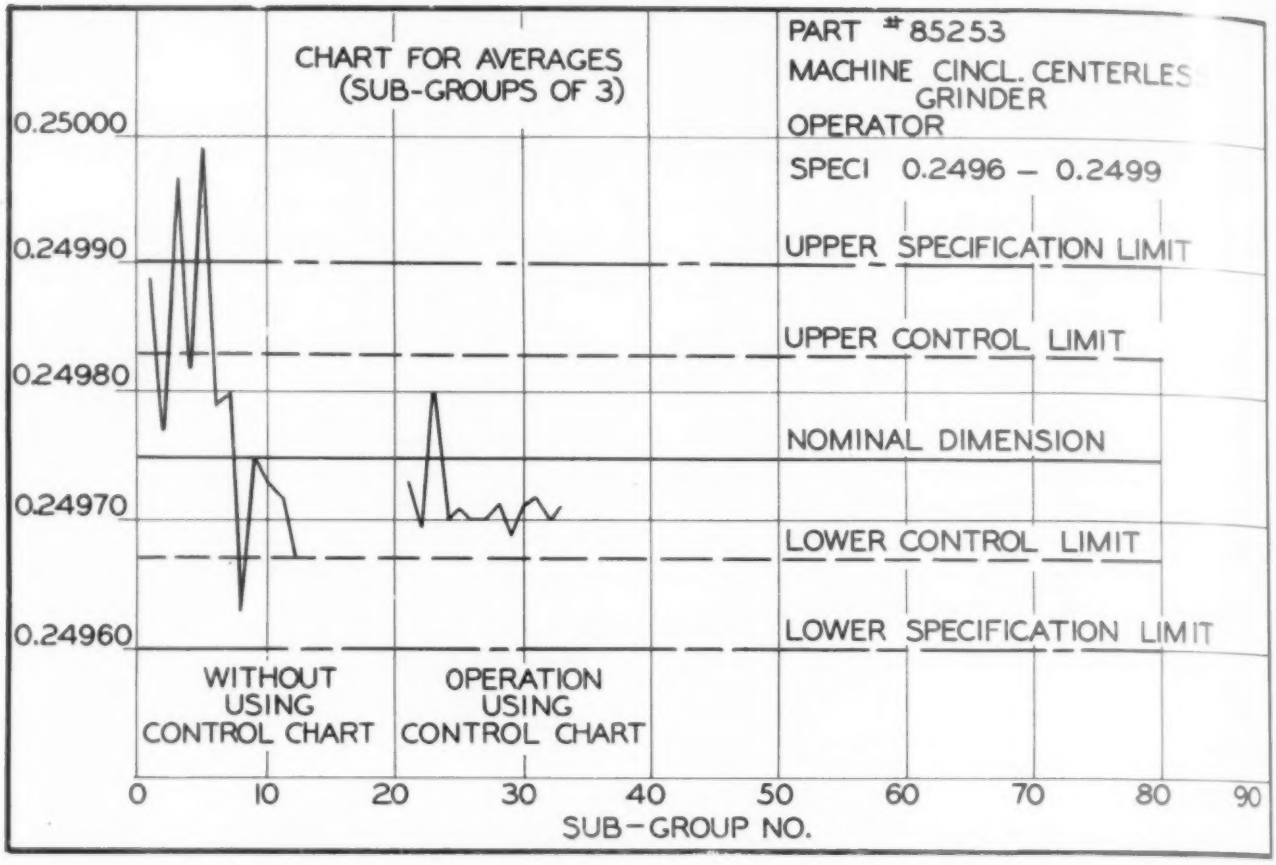


Fig. 3, a chart showing averages of three successive groups of parts, ground on a centerless grinder, having 0.0003 in. tolerance.

three successive groups of parts, produced on a centerless grinder, having 0.0003 in. tolerance.

The averages disclosed that the operator was adjusting the machine when he should have left it alone, and failing to adjust when this was necessary. This was because normal examination of one or two samples led him to believe that the machine had shifted when it had not, and vice versa.

He did not recognize, nor could he be expected to recognize, that sometimes his samples would be nearer the largest or smallest part of the specified dimension. The chart also showed a rapid change in the average size of parts produced, tending toward undersize. This was due to failure to lock the lower slide to the base. While this clamping was not necessary on roughing passes, it was essential for work held to 0.001" tolerances or less. And these two factors caused wildly erratic averages, many of which were outside the control limits.

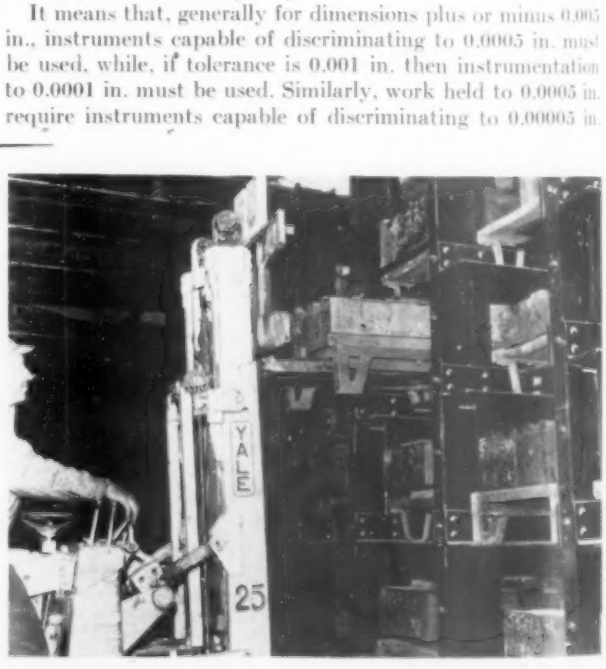
An important item in dimensional control is the tools used for inspection. In order to effectively operate quality control charts, it is necessary to use instruments capable of discriminating within 10% of the specified dimension. This need is so vital that it extends to all dimensional inspection, whether or not under quality control.

It means that, generally for dimensions plus or minus 0.005 in., instruments capable of discriminating to 0.0005 in. must be used, while, if tolerance is 0.001 in. then instrumentation to 0.0001 in. must be used. Similarly, work held to 0.0005 in. require instruments capable of discriminating to 0.00005 in.

Stacking for Die Storage

In line with an expansion program at the Ft. Wayne, Indiana, Works of the International Harvester Company, heavy forging dies are stored in a building equipped with steel racks especially designed to handle the dies on individual skids. This skidding greatly facilitates the stacking and removal of the dies since there is no interference with the fork of the lift-truck either at storage or in the forge shop.

The storage racks are arranged along both sides of an aisle, and provide for stacking the dies five high. In all, present space provides storage for 465 dies, with space useable almost up to the roof truss beams, which are welded to the channel-section uprights which thus support both roof and die racks. The fork of the truck can be elevated to remove or stack any die in a tier, and dies may be moved from forge shop to die shop, if repairs are needed, in each case being carried on their individual skids.



A fork truck handles heavy forging dies, mounted on individual skids, in the die storage building at International Harvester Company's Ft. Wayne Works, Indiana.

By Frank Martindell

Predicting Results of Conveyor Line Assembly

The Fewer Pieces Handled, the Fewer the Movements Required by an Operator

The average engineer who lacks experience in the application of continuous assembly or conveyor methods to the assembly of small parts is often at a loss when requested to estimate the savings resulting from such rearrangement of assembly processes. There is a considerable saving in such rearrangement, which traces back to the fact that the fewer parts an operator has to handle, the more rapidly can be learned the method and rhythm and the less the hesitation which will accompany operator efforts. This factor may be termed the diversity factor of assembly.

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Some years ago the author started a collection of figures relating to this factor in an effort to provide a means of predicting, on a simple basis, the results of the sub-division of operations. These data, covering the over-all output of a number of assembly operations principally dealing with electrical equipment, such as relays, switches, keys and similar articles, involve not only the handling of springs and insulators but also the driving of small screws.

Relationship of Parts Handled

It was found that there is direct relation between the number of parts handled by the operator and the number of parts handled per day. This data was collected and reduced to the form of a curve, Fig. 1. It will be noted that, on the left hand side of the curve, are set the total number of pieces handled per day of 8 hrs. and at the bottom the number of pieces per assembly per unit. The relationship between these two factors is shown by the curve. In collecting the data for this curve, each part of the assembly was considered as one unit. Each part of the jig or fixture which had to be handled was regarded as one piece when placed and one piece when removed. The picking up of the screw driver or other tool was regarded as one piece and laying it down again was regarded as another. That is, the chart really shows the total number of movements per day.

The fewer pieces handled, the more closely they can be placed to the operator and the fewer the movements required to pick them up; consequently, the output increases very rapidly as the number of pieces handled is reduced. The minimum number of pieces which will give the maximum output is not two as might be assumed, but three. This is due to the fact that there is a certain alternating rhythm established in the handling of three pieces which is broken in handling two. Because of the unexpected character of this data, this point was checked very carefully in order to make certain of its truth.

The method of using this chart may be illustrated as follows: Let us assume that a count of the number of parts in the assembly and the number of parts of the jig which had to be handled totals up to 50. At this point, it will be found

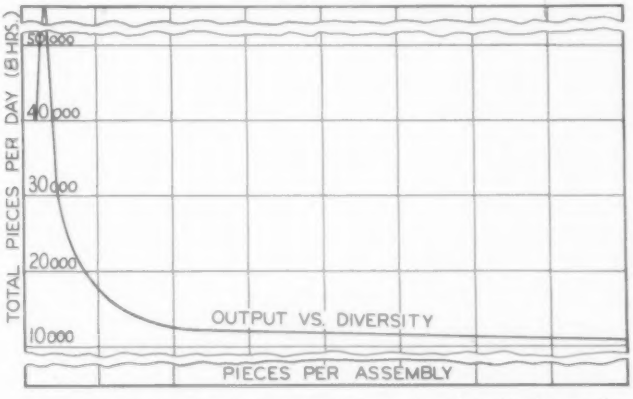

Fig. 1. Chart showing—left hand marginal column—the relationship between the total number of pieces handled by an operator in an 8 hr. day, and—at bottom—the number of pieces per assembly per unit.

that about 11,000 pieces will be handled in an 8 hr. day. Let us now reduce the number of pieces handled by division of operations and the providing of mechanical means of passing the fixture from operator to operator to a maximum of 5 pieces per operator. It will be found that the total figure rises to 30,000 pieces per operator. That is, a team of 10 operators would handle 300,000 pieces as against 110,000 as individuals.

The general shape of the curve is the most important thing since the actual figures will vary from one industry to another. The relation can be quickly established, however, by a simple count of the number of parts handled versus the total output per day in the plant in question and the chart can be easily reindexed for use in any actual organization.

Conference to Complete Screw Thread Standardization

A joint conference of representatives of Government committees and industrial standardization groups from Great Britain, Canada and the United States is scheduled to meet within the next three months to finalize agreements on common standards for screw threads used on most types of threaded fasteners, including bolts and nuts.

The agreements will be in the form of documents submitted by each country, differing slightly in detail, but setting assent on fundamentals for a Unified Screw Thread Standard. There will be two documents submitted by the American groups, one of which will be the Proposed American Standard for Unified Screw Threads prepared by the Sectional Committee on the Standardization and Unification of Screw Threads.~ The Committee, organized order the American Standards Association by the ASME and SAE, will present the views of American industry. The second American document will present the standard adopted by the Interdepartmental Screw Thread Committee, composed of members of the Army, Navy, Air Force and Commerce.

By Frederico Strasser

Gravity Pressure For Drawing Dies

A method for attaining Diminishing Pressure as the draw proceeds

Drawing dies for thin material require blankholding pressure to prevent wrinkling of drawn shells. Pressure required depends largely on stock thickness and diameter of the part; for instance, the thinner the stock and the greater the reduction in ratio to blank diameter, the greater the blankholding pressure that would be required.

Ordinarily, blankholding pressure is effected by double-acting presses, compressed air devices, rubber cushions or compression springs. The latter are popular with die makers because they may be had standard in most instances, and are easy to install and replace.

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However, they have the fault that blankholding pressure is not only not constant, but increases as the drawing operation proceeds. Therefore, their function is exactly opposite to that desired, which is diminishing rather than increasing pressure as the draw proceeds. The same holds for rubber cushions, which also build up increasing pressure.

Diminishing Pressure Desirable

While both double-acting presses and air-operated devices furnish constant pressures, the one is fairly expensive as compared to single-acting presses, and many smaller plants —and especially those in remote sections—may not have the facilities to operate pneumatic devices. But as for that, none of the aforementioned equipment or devices present an ideal condition, which is decreasing rather than increasing blankholding pressure during the progress of the draw.

A simple method for achieving this ideal condition is shown schematically in the several diagrams. This method consists of a simple lever arrangement in which a weight, suspended from a lever, furnishes the necessary initial blankholding pressure the while it permits of diminishing pressure as the draw progresses.

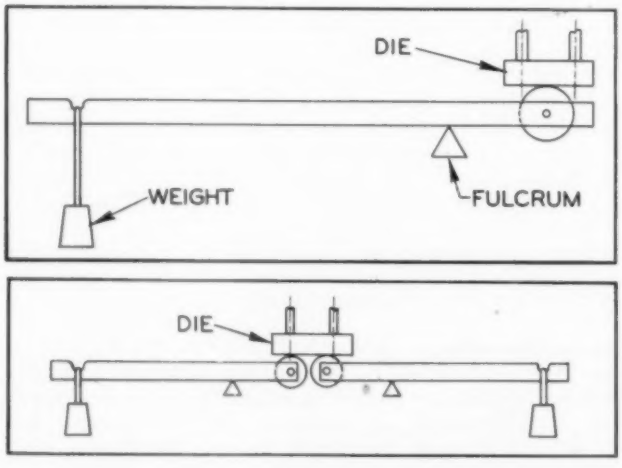


Fig. 1, at top, shows simple basic principle of the roller-lever used to obtain diminishing blankholding pressure for drawing dies. Average lever ratios of 1:7 to 1:10 would be appropriate, and the counterweight can be varied to suit operating condition.

Fig. 2, at bottom, shows a double lever arrangement, used for large dies, to equalize tension.

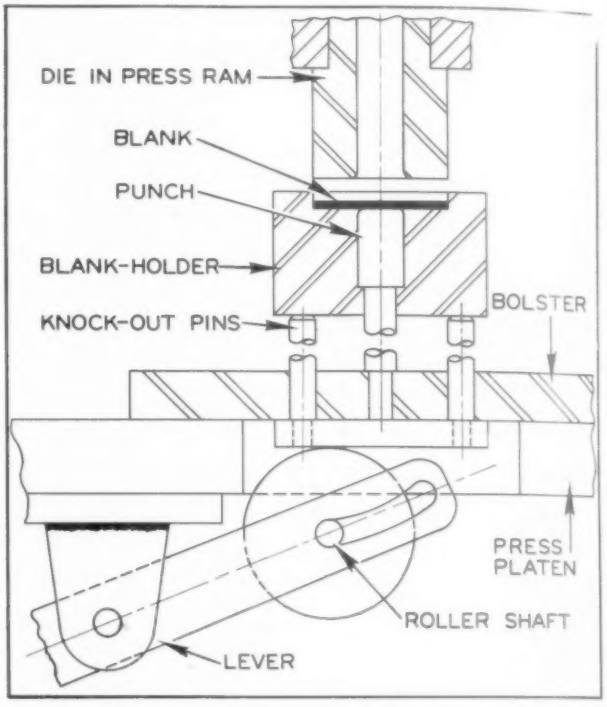


Fig. 3 is a schematic sectional diagram through an inverted or "upside down" drawing die in combination with the roller-lever, with the ram at top of stroke. At this point, the roller is nearest to the fulcrum of the lever, thereby giving increased pressure at the start of the drawing stroke.

The basic principle is shown in Fig. 1, in which the lever ratio permits the use of a comparatively light counterweight. Average ratio of 1:7 to 1:10 would be appropriate. Fig. 2 shows a double lever arrangement designed to effect a balance; this, however, is merely supplementary to that shown in Fig. 1.

Fig. 3 is a section through an inverted or "upside-down" drawing die in combination with the leverage, and Fig. 4, A, B, C and D a schematic presentation of the working principle. A shows the roller at start of down-stroke, when pressure should be greatest; B and C are intermediate positions during the down-stroke; and D shows position at end of stroke, when lever ratio is smallest.

Diminishing Pressure Achieved

It will be noted that the roller shaft travels in a curved slot, inclined toward the lever fulcrum when the ram is at top position. As the ram descends, the roller moves outward, resulting in diminishing pressure during the working stroke. The curved slot tends to govern the to and fro movement of the roller as the lever rocks on its fulcrum.

While the device shown is simple and practical and effects the desired purpose—that is, diminishing blankholding pressure during the progress of a draw—there may be times when the use of counterweights would not be feasible. Under such conditions, either a compression or a pull spring may be

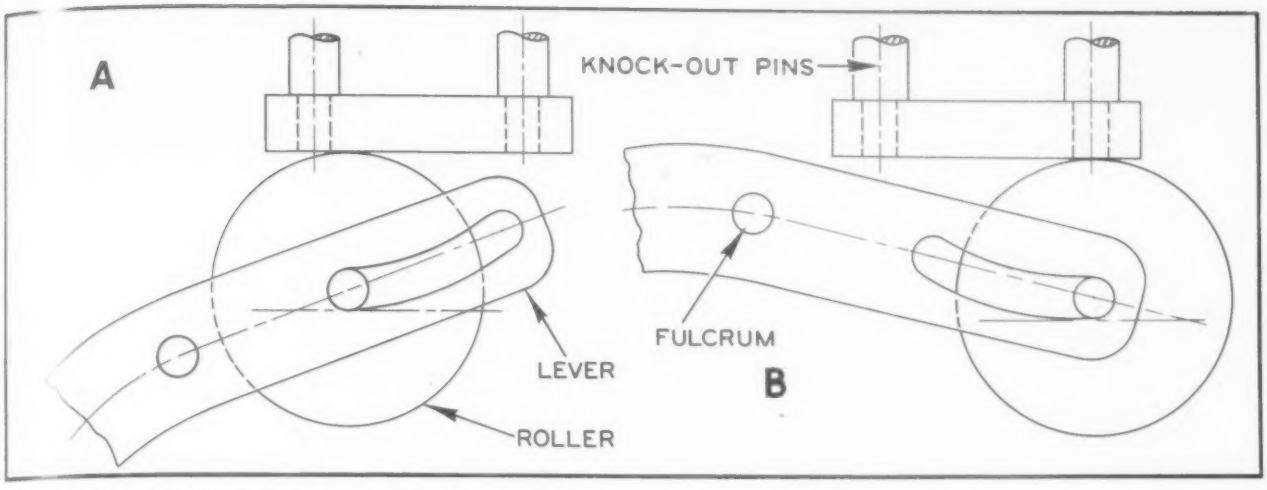


Fig. 4 shows lever ratio changes as the press ram descends. At A, the press ram is at top of stroke, with roller closest to lever fulcrum and thereby providing maximum pressure. At B, the ram is at bottom of stroke, having progressively increased the distance between the roller and the fulcrum and, in consequence, decreasing the pressure on the blankholder. As may be inferred, the curved slots tend to control the to and fro travel of the roller; also, the curve tends to provide a descending incline as the roller travels toward the ends of the slot. The diagram is schematic and details shown in previous illustrations have been omitted.

substituted for the counterweight. And while springs would cancel out the ideal condition, there is the consideration that their increased length provides a fairly uniform tension and slight increase is offset by the decreasing leverage as the roller moves outward. Therefore, pressure would be practically constant instead of increasing. Two types of spring action—pull and compression—are shown in Fig. 5.

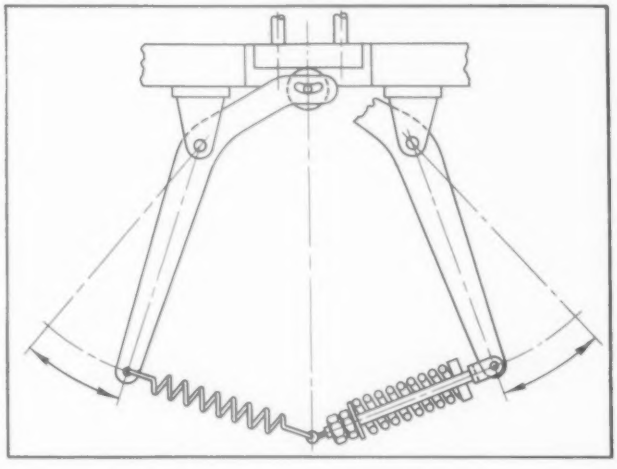


Fig. 5 at right shows how springs may be used, in place of the counterweight, when space or installation limitations preclude use of the weighted lever. The two actions are practically alike, the only difference being that the lever at left employs a pull spring while the one at right employs a compression spring. The latter is preferred since spring tension can be adjusted by means of the nuts. While tension would increase as the springs open or close, depending on which type is used, the outward movement of the rollers would decrease the leverage and, consequently, the blank-holding pressure.

Broaching Helical Oil Grooves

Shown in the photograph is an interesting application of broaching, in which up to 30 internal 10-degree helical oil grooves, in connecting rod piston pin bushings for diesel engines, are broached at one pass. The bushings shown are 3 in. internal diameter, and made from SAE No. 64 bronze.

The machine used is an Oilgear 15-ton sideplate press, and production is at the rate of 125 bushings broacher per hour, the machine operating at 85% efficiency. Other 10° helical grooves 1/32 in. wide x 1/32 in. deep are also broached in the lower half only of larger bushings.

In operation, the bushings are loaded in a pocket of the fixture and supported by a thrust bearing. As the broach is pushed downward to start the cut, the lead on the broach imparts a rotary motion to the work, which continues to rotate until the pass is completed.

As soon as the part is broached, a positive tool holder on the ram is released and an air cylinder lowers the tool. The press ram then returns to starting position. As the tool is lifted by the air cylinder, detents on the tool shank lift the bushing out of the fixture for easy removal. After the finished part is removed from the tool shank, the press ram moves down to engage the positive tool holder and then lifts the tool to starting position.

The interesting feature of the setup is that, contrary to usual practice in which either the broach is made to turn by means of built-in helix lead, or the fixture made to rotate by mechanical means in synchrony with the advance of the broach, the rotation is effected by the comparatively frictionless turning of the thrust bearing as a result of tool pressure.

Piston pin bushings, for diesel engines, are broached with a 10-degree internal helix at the rate of 125 bushings broached per hour. A thrust bearing in the simple fixture permits the part to turn in synchrony with the helix of the broach and the entire operation is practically automatic.

34-31000

Piloted Boring Bars

By A. E. Rylander

Installment No. 4 of a Series

WHETHER USED WITH boring fixtures or turning machines—that is, engine or turret lathes—piloted boring bars are made in so many styles that there is no arbitrarily established standard. However, certain fundamental rules apply to all piloted bars, and these rules are:

1. For accurate work and sustained tool life, the bar must be made of a good grade of carbon or alloy steel if small in diameter, but can be made from mild steel if the diameter is comparatively large. In either case, the bar should be hardened and ground to a high surface finish.
2. The bar must have the closest possible running fit in the pilot bushings, allowance being made for thermal expansion due to heat of cutting and running friction. Preferably, annular grooves should be provided, so that dust may be wiped into these grooves during in-feed.
3. The pilot bushings must be of a material conducive to long wear. However, the material to be selected, and the type of bushing used, will depend on the nature of the work and the speed at which the bar rotates.

BARS AND PILOT BUSHINGS

Elaborating on 1 and 3, in that order, the bar must be designed for minimum spring-back when cutting, and as large in diameter as possible consistent with chip clearance, to absorb vibration. A chattering tool will not produce a good surface finish.

Pilot bushings may be commercial standard drill bushings, either pressed-in—preferably into a liner bushing—or slip type, the latter naturally being used in combination with a liner. Or, they may be made of bearing bronze or Meehanite. If speeds are high, standard rotary bushings should be used as suggested in Fig. 17, the preceding installment.

Fixtures for boring should be provided with leader and follower pilots, the diameter of the latter preferably made larger than the maximum bore diameter, as suggested in Fig. 16, preceding installment. This holds true even for boring fixtures for engine or turret lathes; for such applications, however, the bar should be held in a floating or self-aligning holder.

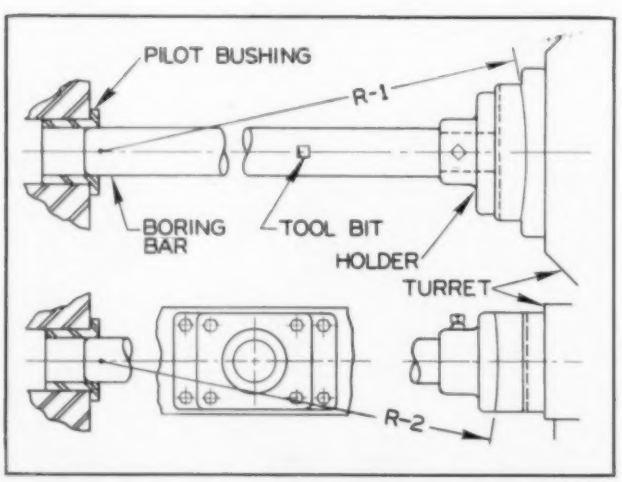


Fig. 18 shows a method for aligning a boring bar used with an engine or turret lathe. Should the tail-end of the bar be below or to one side of the spindle center-line, then the tool will cut large at the start of the bore and gradually taper inward as the cut progresses. That is, the tool will "climb." By providing a holder with convex to concave faces, as shown, the tail end of the bar can be accurately aligned with the spindle. Radii R-1 and R-2 should be the approximate distance from the end of the bar, as it enters the bushing, to the respective curved faces of the holder.

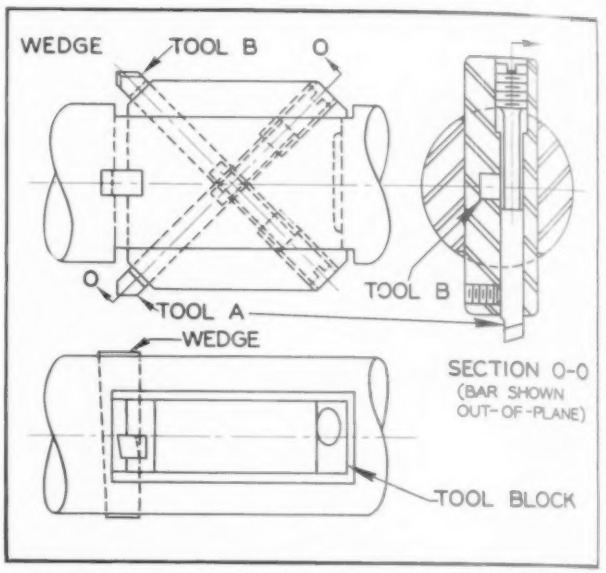


Fig. 19 shows a block inset containing two tool-bits. The cutting faces of both tools are on the center-line—that is, the tools cross over-and-under. The heel of the block fits symmetrically milled flats on the bar, while a wedge forces the block against the back of the slotted opening in addition to providing lateral alignment. The tool block shown is proportional for 5/16 tool-bits, and the holes are tapped for 7/16-20 adjusting screws before broaching. In place of the square broached holes, the block may be made in symmetrical halves, with both tool slots milled, and the halves joined by means of screws, rivets or welding.

Where the work precludes use of a leader bushing, then provision should be made for accurately aligning the bar between tailstock or turret and the pilot bushing in the machine spindle. The reason is that if the shank end of the bar should be below or to one side of the machine spindle, then the tool will "climb" and cut large at the start of the bore and gradually taper inward as the bar is fed into the bore. A type of holder such as shown in Fig. 18 will permit accurate alignment.

SINGLE-POINT TOOLS FOR PRECISION

While solid-bladed cutting tools are used to a considerable extent in combination with boring bars, these do not have the fine accuracy of single-point tools, and this also holds for inset tool blocks having two or more cutters, as suggested by Fig. 19. Such inset tools are locked in place by means of wedges or taper pins, or even by set screws. However, these tools are incidental to the theme, which bears on precision boring with single-bit tools.

Commercial tool bits are available in either squares or rounds, with the latter largely confined to carbide bits. While the square bit may be favored because it can be form-ground and so facilitates insertion into the bar, with proper rake angles, the round bit has the advantage of less expensive

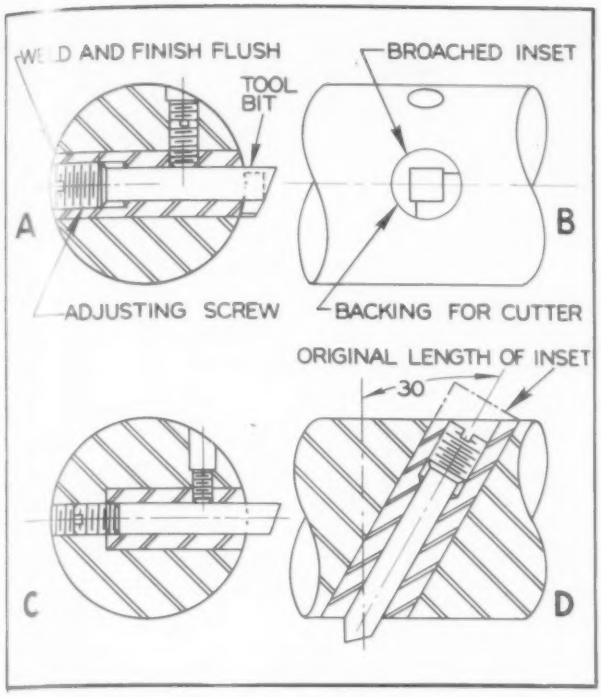


Fig. 20. Instead of broaching square holes in boring bars, to suit standard tool-bits, standardized broached insets require only reaming a hole to suit the O.D. of the inset, which is pressed into place and, preferably, brazed or welded to the bar for greater security. The tool bits should be backed up, as shown, and this backing may be provided by the inset itself, as shown at A and B. Threads for adjusting screws may be tapped directly into the inset, as shown at A, or, the inset may be pressed in partway and the bar itself tapped, but to smaller size, as shown at C. At A, the inset is shown set straight across in the bar, and at C, set at an angle.

machining. All that is required is that a hole be drilled and reamed in the bar, to fit the bit; this hole, then, may be tapped direct for the adjusting screw.

Bars for square-bit tools, on the contrary, must be broached to the size of the bit; as a result, the tapped hole for the adjusting screw must be as large—or larger—as the distance across corners. In such design, the hole is first drilled to tap-drill diameter, part way down, and the hole drilled through to broaching size.

BROACHED HOLE INSETS

Now, however, there are available broached insets, as shown in Fig. 20, which only require drilling and reaming to the O.D. of the inset, which may then be pressed into place and, preferably, welded or brazed to the bar for greater security. These accessories greatly facilitate manufacture of boring bars and also reduce costs.

A question may arise as to what is the best angle at which a tool-bit may be set in a bar. For this, there is no hard-and-fast rule, some designers preferring a tool set crosswise, some at 30°, and others even at 45°. Thirty degrees, as shown in Fig. 20, may be suggested as a happy medium, the angular setting providing a somewhat finer adjustment than the straight-across.

The cost of manufacture of boring bars may be considerably reduced by resort to pressed-on cutter heads, as suggested by Fig. 21. This, however, applies mainly to bars for large bores where it is desired to hold the pilot diameters comparatively small, or where it may be desired to use the same bar for boring of different diameters. Obviously, such design not only saves a considerable amount of material but also time ordinarily consumed in turning.

To reduce tool spring-back, with its resultant chatter, the tool bits should be adequately backed if there is any appreciable overhang or extension beyond the bar or cutter head. Suggested backing is shown in Figs. 20 and 21. In all cases, locking screws should bear on the leading or cutting faces

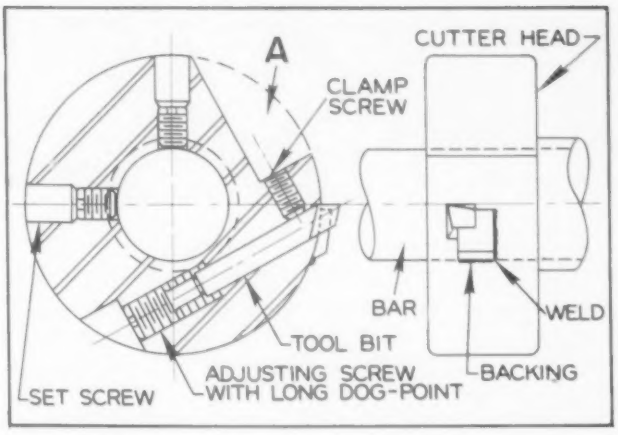


Fig. 21 shows how a cutter head may be pressed onto a bar of comparatively small diameter, thus saving considerable expense in material and time consumed in manufacture. The cutter is set at an angle of 30° approximate in relation to the horizontal center-line and the slot clears the bar. Note backing for the tool-bit. Note, also, that the block has been milled straight across for clearance for the clamp screw—a less expensive method than counter-boring the clearance, as suggested by the dotted lines.

of the bits so that the latter may have the comparatively solid backing of the bar or cutter head.

Interrupted cuts may be "bridged" with negative or shear rake cutters, as suggested by Fig. 22. Depending on the width of the interruption and the depth of the cut, a tool of this type will be entering the far side of the interruption while it is still engaged with the near side. Where the gap is too wide to be spanned by the tool, then a second tool, somewhat staggered, will be cutting while the first tool jumps the gap. Preferably, both tools should be negative rake.

It happens, at times, that a bore will choke up because of fine, thread-like chips, this condition not only interfering with the cut but also with coolant flow. In such cases, the cut can be started from the back end of the bore, feeding away from the spindle. Thus, coolant can be directed to the point of the tool while the "hay" can be pulled out from in front.

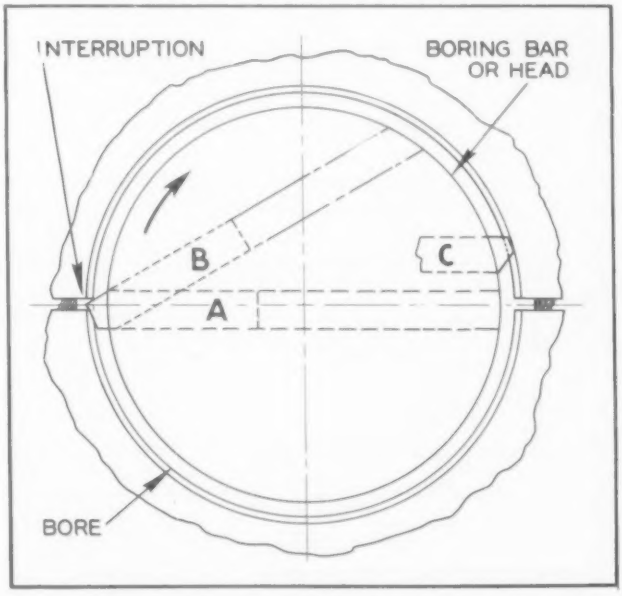


Fig. 22. Interrupted cuts may be "bridged" with negative or shear-rake cutters, as suggested by tools A and B. The latter is shown set at a 30° angle in relation to the horizontal center-line, thus automatically providing a corresponding negative rake. However, tools may be raked as much as 45°, should occasion warrant. Where the gap is too wide to be bridged, an opposed tool, slightly staggered in relation to the first, will be in the cut while the other is jumping the gap.

Installment No. 5 will follow in December issue.

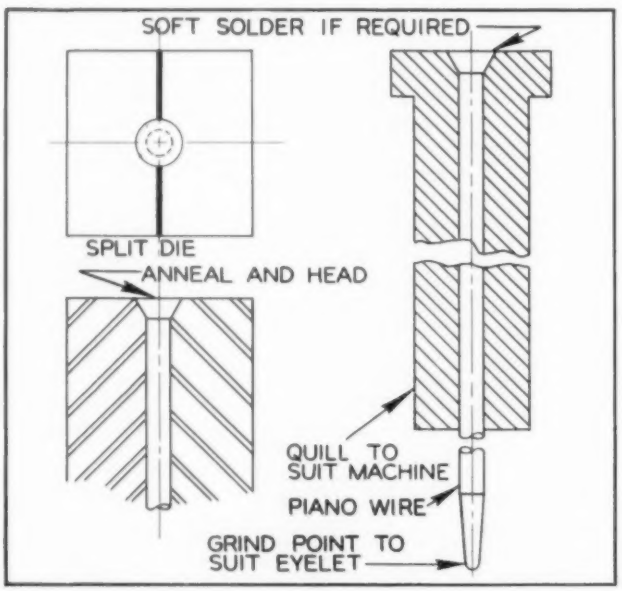
GADGETS

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

Readers in general, and members especially, are cordially invited to submit ideas which may suggest short cuts in manufacture or which may be directly appended to some specific tooling problem. The Tool Engineer will pay $5.00 and up for accepted contribution to our Gadget pages.

PIANO WIRE FOR EYELET MACHINE NEEDLES

The pickup needles used in eyelet machines to remove the eyelets from the chutes, are subject to a very severe bending action. Since they are hardened, needle breakage is frequent, particularly in the small sizes.



Pickup needles may be mounted in split holders, with smaller sizes soldered in place.

The use of piano wire for these needles is an excellent solution of the problem. It can be purchased from steel supply houses in a variety of sizes, straightened and cut to length. The accompanying sketch shows the method of mounting in the holder. It is sometimes desirable to solder in small sizes where it is difficult to form an adequate head to retain the needle in the quill.

Frank Martindell
Chicago Chapter, ASTE

PRECISION COMBINATION CASE

To be completely adequate for precise inspection purposes, gages should not only show correctness or errors, as the case may be, but also where mistakes have been made in the machining of a part. From the knowledge thus gained, one can then take the necessary steps toward correction.

Whenever conditions warrant, therefore, gages should be designed and built so that the inspector using them can determine at what stage in a series of operations an error occurs. If then, the error is due to faulty tool design, this can be corrected, and if the fault lies with the operator, he can be properly instructed in the use of the tools.

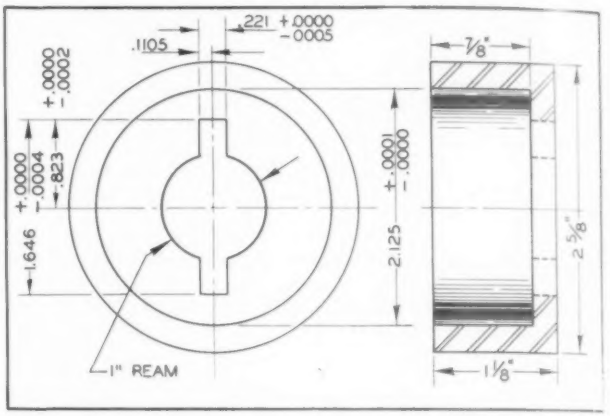


Fig. 1, Drive collar held to close limits of tolerance.

The combination gage described here, designed to check the drive collar shown in Fig. 1, suggests design aimed both toward checking for correctness and determining the point of faulty machining, if any. The part is a production job which must also be interchangeable and therefore held to close limits of tolerance. The gage is required to check the diameter of the bored hole, the width, height—or overall distance—and the centrality of the two keyways in relation to the bored hole. The gage, which was built by Sansea, Inc., Providence, R. I., is hown in Fig. 2.

The body of the gage, A, is made from tool steel, drilled and reamed for a $\frac{3}{8}$ in. construction hole. Opposite sides are milled flat and later ground, equidistant from the center line; also, the two slots are milled in line with the center line. Two tool steel blocks are then machined and dowelled and screwed to the body.

The assembled unit is then turned to grinding size, disassembled and the several parts hardened. The flats, as well as the slots, are then ground, the parts reassembled and the O. D. ground to the specified limits. The gage fingers C are

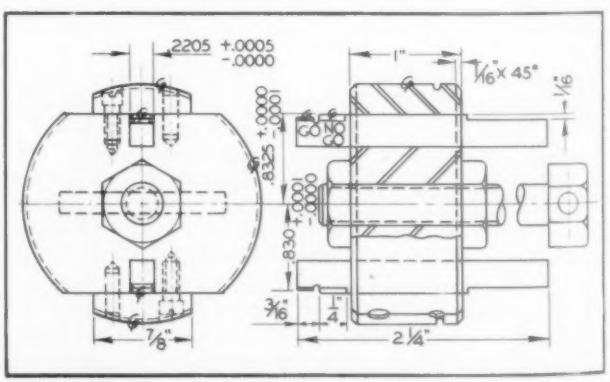


Fig. 2. The Gage, designed to check diameter of large bore and centrality of keyways.

next machined, hardened and ground as shown, and assembled into the slots with just enough press fit to hold them in place. They are ground in pairs, along with the "go" and "no go" surfaces, both alike.

While the dimensions have not been mentioned in the text, since they relate only to the particular job—or part—described, they are shown on the part and gage drawings so that the reader can see their relationship.

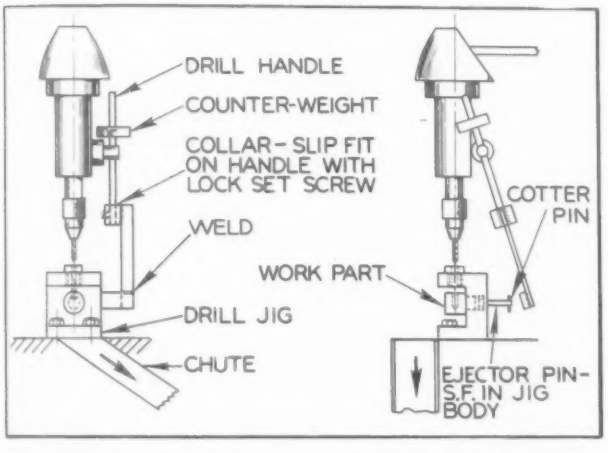
The point is that the construction not only provides for easy machining—as, for example, milling the slots instead of broaching—but also insures maximum accuracy and symmetry since the slots can be ground after hardening. The handle itself is elementary, consisting merely of a hix screw held in place with jam units and provided with a pin for convenience in handling.

This gage has several inspection functions. It checks the 2.125 in. hole, the depth and width of the two keyways and their relation to the 2.125 in. hole.

Robert Mawson
Providence, R. I.

WORK EJECTOR FOR DRILL PRESS

The sketch shows a simple method of materially decreasing the handling time of certain types of small drill press work. If the hole size is small enough, and the shape of the work piece is such that the part can be placed in the jig and held without mechanical clamping, the method shown will eliminate the manual removal of the work from the jig.



Only a slight extra motion of the feed lever is required to eject work and to clear for loading the next workpiece.

In the example shown a small hole was to be drilled, on center, in the large diameter of a pin. A simple drill jig, in which thumb pressure on the end of the part was sufficient to hold it was bolted to the machine table and an ejector pin of the type shown was incorporated in the jig. A simple welded bracket was attached to the drill press handle so that, with the spindle in the fully raised position, the bracket would actuate the ejector pin. This ejected the work piece into the chute in front of the jig from where it slid into the tote pan.

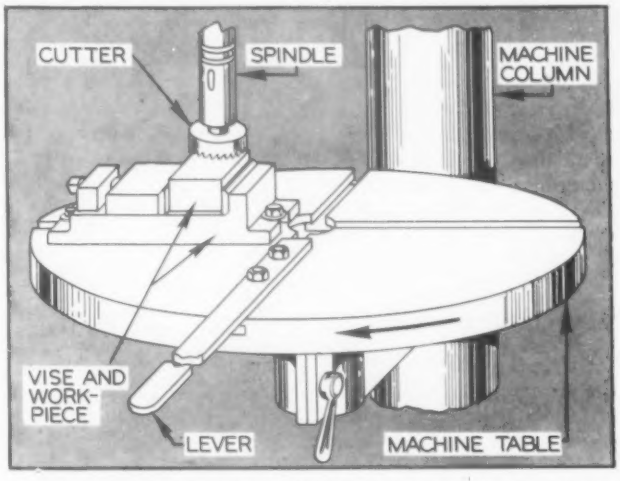
The only unloading work required on the part of the operator was a slight extra motion of the drill handle to eject the work and to retract the handle to permit loading the next piece. In actual operation a time study failed to detect any increase in operation time of the handle so that the whole unloading time was eliminated. Since the operator can leave his right hand continuously on the drill handle and only uses his left hand to pick up, load, and hold the part a very efficient operation without waste motion is the result.

Paul H. Winter
Syracuse, N. Y.

MILLING ON THE DRILL PRESS

It is often possible to do a fairly creditable job of hand milling on the drill press, as suggested by the illustration. Since, however, the drill press is not provided with table traverse, the job calls for the round-column type of machine equipped with a rotable table mounted on a swinging arm. By clamping a bar to one of the table slots, as shown, one obtains leverage for the cut.

As the direction of the cut is in a curved line, the workpiece should be clamped at a distance from the table center



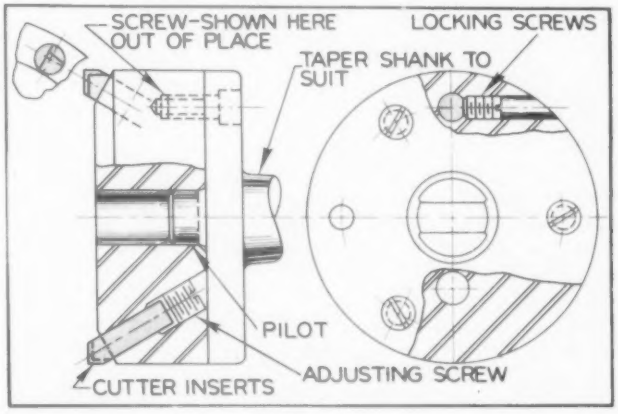
The table is rotated, by means of a lever bolted to the machine table, to provide hand feed for the milling cut.

which will permit milling in one pass, yet, it should be held as close to the center as possible, for increased leverage. Also, the spindle should be drawn up as high as possible, to reduce the chatter that would ordinarily result from overhand. While not recommended for precision work, the method is nonetheless practical for short-run jobs calling for only nominal limits of tolerance. *R. Andrews*

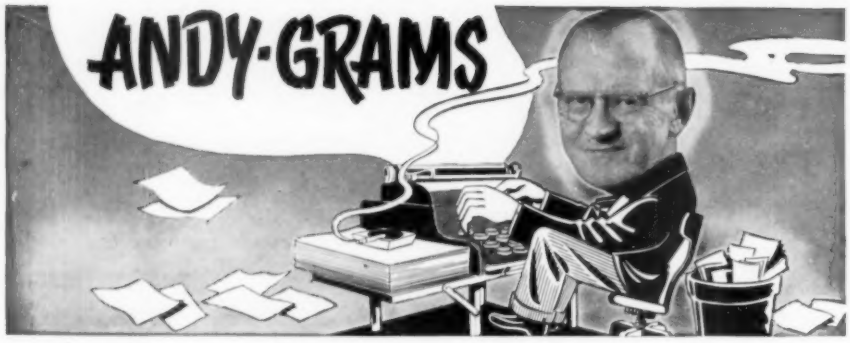
INSERTED-TOOTH MILLING CUTTER

The milling cutter illustrated is easily machined from round stock. No dimensions are shown, as the cutter may be made in various sizes to take standard carbide tool-bits. The shank can be turned integral with the cover plate, or the pilot may be pressed into the plate and welded, if so desired.

Holes are reamed, at a 30° angle, to suit the cutter bits, which are backed with adjusting screws. The locking screws bear against the cutting face of the bits, for solid backing against the cutter body. *Carl Bjorklund*
Detroit Chapter, ASTE.



Easy machining features this inserted-bit milling cutter, the body and cover plate of which are turned from round stock. The number of inserts will depend on the diameter of the cutter.



As intimated last month, I took me a vacation and, in the course of a roundabout tour that took in desert, mountains and coastline, looked in on the Semi-Annual at Los Angeles. A most interesting trip which I'll describe in part for the benefit of stay-at-homes as well as a "refresher" for seasoned travelers who like to revisit wonted scenes.

Going through New Mexico, I made the acquaintance of Dr. C. L. Lowman of the Orthopaedic Hospital, L.A., whose knowledge of the surrounding territory greatly enhanced the pleasure of the trip. Broad stretches of desert, dry rivers, adobe huts festooned with red peppers and, in the remote distance, the towering peaks of the Rockies.

The first palm! Then, rows of eucalyptus trees—but no kaola bears—standing guard around the orange groves. Then L.A., and the Biltmore, where I exchanged greetings with the convening ASTEers. Not a big gathering, as ASTE conventions go, but the West Coast boys had extended themselves to provide pleasure and entertainment for the visitors.

Hans Bamberger, erstwhile of Detroit but now a "native" Californian; Mert Seavey, Anton Peck, Lew Hawes and Carl Bues, the latter a dead ringer for my grandfather—and what a grand old man he was! Greetings from Jimmy Giern of Giern & Anholtt, Detroit, to Art Denis of L.A. who was just back after hunting peccaries down in Mexico. Also greetings from Henning Freden of Aero-Nat Tool & Die, Detroit, to son Karl. Seems almost everybody's got somebody in California.

Ambling around a little park in the middle of downtown I thought I'd got into an open-air nut factory but it was just a forum for screwballs who took turns spouting isms and doing yogi stuff. Guess that's where the movie comedians get their zany ideas.

At that, I want to refute one canard about L.A. I'd heard so much about the crazy drivers out that way that I was on the alert, but soon relaxed a/c I have never seen such courtesy on the part of drivers anywhere in the U.S.A. And that goes for the people out that way as a whole—they're all wool and a yard wide.

Spent an evening with Tom Dickinson, in the course of which he presented me with an autographed copy of his latest book—"The Aeronautical Dictionary." Tom took me up to the Planetarium where, from the heights, I had a breath taking view of the city. Also a get-together with Fred Burt, whose articles, like those of Tom Dickinson, have created considerable interest among our readers. Also, among scribes, a handshake with likeable Carl Harrington of Mill & Factory.

Time being short, I checked out Wed. A.M. and took the Coastline to San Francisco where I got kinks in my legs climbing the hills. In a way, Frisco reminds me of Providence, both towns being on tidewater and surrounded by high hills. Relayed greetings from Harold Norberg, of Plan-O-Mill Corp'n, Detroit, to son Kenneth, now prex of Norberg Tool & Die Co., Frisco.

Well, I saw some wonderful sights, but "east, west, hame's best," which is another way of saying that home is where the heart is. And with me, the heart's with the family, apropos which I couldn't get home fast enough. Got back on my birthday, to find a welcome and greetings, including a card from John Sylvester of Boston and a huge bouquet from the Swedish Engineers Society, Detroit. Also—and I mention this because it's one of those little things that create friendliness—a card from Fort Shelby Hotel that sweetens my daily coffee.

Speaking about coffee, I was just stepping out for my "dram" when in pops Marvin Eidson, from Atlanta, with whom I had a most pleasant visit and reminiscences of my trip to Atlanta Chapter a while back. Well, there's pleasure and sorrows, apropos which I was shocked and saddened, on my return, to hear of the untimely passing of George T. Kock, prex of Engineering Service, Detroit. George ranked high in the field of tool engineering and was an energetic exponent of professional engineering. Turn down an empty glass.

In the course of travel, one meets people of all types and in all walks of life. And all are interesting, once you crack the first shell of reserve. Thus, going west, I talked with a youngster whose goal was a million dollars; his hopes were as wide as the unlimited spaces. I wished him luck.

Coming back, I talked with a man who had lost a fortune and who, as a result, was utterly discouraged. "What are you worrying about?" I asked. "You started once, didn't you, so what's the matter with starting again?" "But," he said, "I'm over fifty, and my total assets are less than a thousand dollars."

That made me mad. "Listen," I said, "I've got friends in their sixties who have started again, from scratch, and who are forging to the top. And as far as you are concerned, you have everything—comparative youth, experience to burn and a thousand dollars to boot. All you lack is guts—!" Then he got mad, and so we argued until he talked himself into the whoopingest plan for success you ever heard of! And we parted friends.

Unless they've inherited money or position, there are comparatively few men who have achieved success before their forties. And where men in this minority come into position of authority, they will invariably surround themselves with executives on the shady side of middle life, men whose matured experience far outweighs the enthusiastic eagerness of youth. So, given faith in one's self, the world is an oyster to the guy with know-how and the will to apply it. All this for the benefit of anyone who might be discouraged.

Speaking about know-how, did you ever stop to figure that if you boys north, east, west, south put on your thinking caps you could submit enough "gadgets" to keep us going for ten years. Here we offer top rates for good ideas and publicise it right under the title block of the gadget page, and yet getting you boys to contribute is like milking a dry cow. Now quit stalling and come across! Well, pretty please, then, honeyed words being better than a bawling out.

As I've told you boys before, this is your magazine, and it's going to be what you help to make it. You can't load it all on the editors, any more than you lay the blame for poor government on the administration if you don't vote. And if you don't vote, you have no legitimate gripe. Now, maybe you'll come through with an article or two, eh? Cast your vote (contribution) for a better The Tool Engineer.

ASTEely Yours, *Andy*

ASTE Permanent Home Becomes Reality As Society Staff Moves into New Building

FOR WEEKS the ASTE Central Office has been a beehive of feverish activity —inventorying, cataloging and packing office records, equipment and furniture. Accumulations of early files have been put in order and indexed for preservation as Society archives. Each unit of equipment has been numbered to correspond to the spot where it is to rest in the newly-constructed building which is the fulfillment of the American Society of Tool Engineers' ambition for a permanent home.

As you read this, the headquarters staff will be established at 10700 Puritan Avenue on the northwest side of Detroit, where they were scheduled to move November 1. Here they will have more than 12,000 square feet of space—nearly four times the former area in the Penobscot Building.

Provision for Expansion

Besides providing plenty of elbow room for present activities, the 216x60 foot building can accommodate extensive future expansion. Headquarters employees can now handle more Chapter services, get out mailings and Society supplies with greater dispatch. From the standpoint of flow of material through the office, their efforts are more efficient than in the old, crowded quarters. Employees are now required to punch a newly-installed office time clock.

Heavy equipment is segregated from lighter office machines. One room with ceiling-high partitions houses the accounting machinery. Another permits the most sorely-needed expansion—a greatly enlarged mailing department, spacious enough to accommodate a full stock of data sheets, collating bins, and mimeographing, shipping, unpacking and mailing machine operations.

Other offices are separated by eight-foot plywood partitions stained walnut. Interior of the cinder block walls is painted cream, the exterior, a cement grey.

Fluorescent lights, controlled by one central switch, illuminate the entire area.

A cork acoustical ceiling helps deaden noise. Heating is by an oil-fired hot air plant. Laid out in zones, a refrigerating system will automatically maintain an even temperature during the warm months. Piping throughout is double thickness copper. Roof is asbestos plaster and asphalt paper laid over steel trusses.

At the left end of the building a combination library-conference room is available for board and committee meetings. A 40-foot parking lot extends across the rear of the property for the convenience of employees and visitors.

In erecting the building an almost perfect accident record was established by the contractors, except for a minor mis-

Top: Exterior of new ASTE office building is completed as this issue goes to press. Stones used to construct entrance weigh 3500 pounds apiece. Below: When plywood partitions are stained, cinder block walls painted, and cork acoustical ceiling installed, interior will be ready for occupancy by the Central Office staff of the Society

AMERICAN SOCIETY OF TOOL ENGINEERS
10700 Puritan Avenue
Detroit 21, Michigan

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hap when a cement truck tipped over on a duct. Begun July 1, the headquarters project has been under construction just four months. No material shortages or labor difficulties being encountered, the building was completed on schedule.

Responsibility for the housing undertaking was delegated to a committee headed by A. M. Sargent of Detroit, assisted by W. B. Peirce of Pittsburgh, G. S. Wilcox, Jr., and H. E. Conrad, both of Detroit.

Ray H. Morris of Hartford is Chairman of the Special Housing Finance Committee. Other members of his committee are: C. V. Briner, Cleveland; G. A. Goodwin, Dayton; H. L. Tigges, Toledo; Mr. Peirce and Mr. Sargent.

Since announcement of ASTE Building Fund Participation Certificates, Chapters and individual members have been subscribing liberally to the 10-year, 4½ per cent interest bearing certificates. A brochure giving complete information concerning the building and the certificates will be sent to members and Chapters mailing the coupon appearing on the previous page.

Stag Get-Together Brings Out 'Old Timers'

Wichita, Kans.—Wichita Chapter resumed meetings for the fall and winter season with a "bang-up" stag party at Elkhorn Lodge.

Chairman Leigh Icke, Second Vice-Chairman Hazen Dool, and their committee arranged the affair, which included appropriate entertainment and a Dutch lunch.

Among the 80 members and friends present were a number of "old timers" who came out for the social get-together, and a delegation from Hutchinson.

Chairman Icke, on behalf of the Chapter, presented Past Chairman Harold Bales with an engraved cigarette lighter in token of his service during the '47-'48 year.

Aluminum Drawing Hinges on Flow Analysis, Tooling

Montreal, Que.—Thorough analysis of the principles of flow, and careful tooling, are essential for the successful drawing of aluminum, according to John W. Lengbridge, Project Engineer and Chief Draftsman of Aluminum Goods, Ltd., Toronto.

Addressing 67 members of Montreal Chapter, September 10, Mr. Lengbridge, who heads the Toronto ASTE group, went on to demonstrate with slides flow principles governing aluminum drawing. The metal, he pointed out, must be stretched beyond the limits of elasticity, but not enough to cause fracture. Due to work hardening of the material, the area of reduction must be decreased in successive draws.

Blank holder pressure is an important factor in controlling flow. There should be enough pressure to prevent wrinkling and still allow the blank to be drawn into the die easily. Too much pressure, the speaker warned, will cause fractures in the drawn shell.

Die radius causes a change in shape but not in area, he added, illustrating how contour, thickness and temper of the metal determine the number of draws required.

For irregular shapes, such as a rectangular shell, the number of draws depends upon the depth of the shell in ratio to metal thickness. In rectangular shells there is a drawing zone and a bending zone. Metal must be taken from both to form the finished product. The bending zone primarily controls formation of the corners.

A motion picture showing methods of fabricating aluminum concluded the lecture. Mr. Lengbridge also displayed an impressive array of drawn shells.

Recent Hardening Process Explained by Inventor

Cedar Rapids, Iowa—Seventy-five ASTE members enjoyed one of the most interesting and informative programs ever presented before Cedar Rapids Chapter, September 15.

Milton Garvin, of the Cincinnati Milling Machine Co., held the undivided attention of the group for two hours with his thorough explanation of "Modern Heat Treatment—Selective Hardening." Mr. Garvin left his audience enthused with the revolutionary possibilities of the Flamatic process, of which he is co-inventor.

Other News In This Issue

Left: Cleveland tool engineers and their families inspect engine assemblies at motor building of Ford Motor Co., Dearborn, Mich., during Chapter plant tour. Right: Another group watches progress of car as it moves along final assembly line. Next page, left: Guide explains how laminated glass is processed in "tub" before going to the autoclave for pressure cooking. Right: Whirling buffers apply rouge to large glass sheets for final polish prior to being cut to shape for windows in the company's current car models

Cleveland Charters Train to Visit Automobile Plant

Cleveland, Ohio—Cleveland ASTE members wanted to see the assembly line that put the world on wheels. So they chartered a train, invited their wives, friends and fellow engineers, and set out for Detroit early September 17.

Their plant tour special steamed right up a siding to the Ford Motor Co.'s Rouge Plant in Dearborn, where company representatives met the 335 visitors and escorted them to a plant cafeteria for lunch.

Starting at the final assembly line, the group saw how an automobile begins as a steel frame, gliding steadily along while women employees drill and machine holes for attaching sub-assemblies. Then a conveyor drops the motor and steering gear. The body, one in a series of attractive colors, is lowered onto the moving unit.

Ride While They Work

Riding along the line, workmen fasten these parts, add steering wheel, horn, accessories, connect wiring. Next the front assembly—fenders and grill—is dropped, bumpers are attached, wheels, tires and hub caps placed, small sections of upholstery trim buttoned on, and the hood is secured.

Meanwhile other operators make accessory attachments from a pit beneath the constantly growing car. Finally windows are washed, the body is polished, the motor run-in, and a shiny new automobile rolls off—every two minutes and 24 seconds.

At the next building visited, seven and a half acres of glass are produced daily in a continuous strip three and a quarter miles long, 53″ wide and 3/16″ thick. As the molten mixture comes from the furnace, it is rolled into a glowing plastic sheet, passes through cooling ovens, and emerges as rough, opaque glass.

After the glass has been cut horizontally for convenience in handling, huge abrasive wheels grind it and smaller buffers polish it with rouge. Fascinating to watch is the "butterfly," employing powerful suction cups to grip the glass sheet, which is then lifted from the line, moved into a vertical position, transferred to suction cups on the other side, and lowered into position for finishing the second surface.

When the required smoothness is attained, the glass is cut to fit window openings in the several automobile models. White plastic film is sandwiched between two layers of glass, and the assembly is laminated under heat to produce a clear piece of safety glass.

Engine blocks are machined in the foundry machine shop, then go to the motor department for assembly. This building is laced with chain conveyors, dangling parts arranged in proper sequence for addition to the motor assembly. Here all motor parts are tested and much of the drafting is done.

With the aid of 8125 machines, the engineers learned, auto power plants are machined and assembled in an average time of seven and a quarter hours. Between 4500-5000 motors are turned out to feed the 17 local plants assembling some 4000 vehicles each working day.

To accommodate its motor-minded employees, the company devotes 110 of the 1200 acres at the Dearborn plant for parking the 20,000 cars driven in every 24 hours by members of the 70,000-worker staff.

Between buildings the party glimpsed docks where Ford freighters were unloading iron ore for the steel plant.

Busses, provided by the host firm, conveyed the Cleveland guests to the buildings visited, then took them to Detroit where their train awaited to make the return trip.

Students Compete at Golf

Detroit, Mich.—At noon, September 11, Beverly Hills Golf Course at Warren was overrun by future tool engineers from Detroit College of Applied Science.

The meet, a best-ball, handicap event, was won by Robert Evans and Henry Kurczyk, with a final combined low score of 78 for 18 holes.

Two loving cups, made in the school shop by Tony Simonte, were presented to the victors bearing an engraved brass shield by Jesse Early, the school penman.

Clamped-On Tool Tips Reduce Grinding Time

Los Angeles, Calif.—Philip M. McKenna, President of Kennametal Corp., Latrobe, Pa., addressed Los Angeles Chapter, September 9. His subject, "Development and Use of Kennametals," primarily concerned compounds tungsten-, tantalum-, and titanium-carbide, held in a bond of cobalt.

Characteristics of each were described, particularly titanium-carbide, a substance claimed to have been discovered by the speaker. Clamped-on construction of carbide-tipped tools was explained. This method eliminates brazing strains, a frequent source of failure.

Furthermore, the speaker said, clamped-on tips may be rotated and turned end for end in their shanks, each time presenting a new cutting edge. This eliminates the necessity of grinding every time an edge becomes dull.

Following Mr. McKenna's lecture, a motion picture was shown. Entitled, "Star Kist," the color-sound film depicted a tuna fishing expedition into southern waters, from preparing fishing gear to hauling in 200-lb. catches, and finally processing and canning.

Handling Methods Seen In Conveyor Plant Tour

St. Charles, Ill.—An afternoon tour of the Stephens-Adamson Manufacturing Co. plant at Aurora, September 14, opened the fall meeting season at Fox River Valley Chapter.

The visit led first through the precision bearing division and then into the conveyor fabricating plants. Actual conveyor applications in the construction of the Friant Central Valley Irrigation Project in California were shown in films.

Following dinner at the Fairbanks Hotel and a business meeting, the group heard Dr. Leroy N. Vernon, Industrial Psychologist, relate achievements in applying psychology to select, place and train engineers and others for positions utilizing their abilities to advantage.

Tri-City Group Guests of Walworth Kewanee Works

Officers of Tri-City Chapter confer with John E. Gilchrist, Chairman of Host Committee for Chapter tour of the Walworth Co. plant in Kewanee, Ill., September 8. From left: Keith Saunders, Treasurer, and Elmer B. Benson, Chairman, Moline; Mr. Gilchrist, R. T. Henning of Program Committee, Davenport, Iowa; D. A. Wangelin, 1st Vice-Chairman, Rock Island; and Joseph Zelnio, Secretary, Moline. Forty-two members participated in the afternoon plant visit, with approximately 80 present for the subsequent dinner meeting at the Elks Club. R. D. Seeley, Western Sales Supervisor, Eclipse Counterbore Co., spoke on "End Cutting Tools" and "Operation Crossroads," and W. G. Conner, Jr., Works Manager of the Walworth Kewanee plant, discussed "Going Forward" at the technical session

Armor-Piercing Shell Machined by Special Techniques

Rockford, Ill.—Development of the 57 mm., three-piece armor-piercing shell, from a solid forging being picked up by an electro-magnet to a finished product packaged for the government, was portrayed to Rockford Chapter in a sound film presented September 8 by W. W. Barton, President of W. F. and John Barnes Co.

The motion picture featured machine techniques employed in the Rockford Ordnance Plant, together with an explanatory background.

The problem of machining the 4150 body and cap was not approached by the usual method of lathe turning. A specially designed center column machine hollow milled both shell and cap. Animation was used in the film to illustrate the operation of each station as the forging progressed through the machine.

New Lots of Materials Tested

Numerous physical, chemical, and metallurgical tests were run on every new batch of material to assure correct settings for the induction heat treat units.

By using special tool holding grinding jigs, it was possible for an inexperienced operator to machine correct angles and settings on cutting tools with a Thompson grinder.

The numerous and rigid inspections made on the shell during processing necessitated a strict system of gage control. Several sequences showed the gages being checked and rotated constantly to minimize wear as well as to maintain accuracy.

A special machine, powered by direct-current, was designed to turn the ogive (pointed end of the shell). By a cam arrangement connected to a resistance field, the rpm of the shell was increased as the cutting tool approached the point on the ogive.

Throughout this plant conveyors were used to reduce the number of employees as well as the handling time.

Another interesting feature was chip removal from all machines, accomplished through a system of drainage ditches in the floor. Cutting oils were removed and reclaimed, and the chips shipped away for remelting.

Prior to the technical session, George Torrence, Manager, Small Tool Div., Ingersoll Milling Machine Co., and Third Vice-Chairman of the Chapter, enlightened the group on the advantages of camping under the stars. After a brief resume of his trip through the Painted Desert and the Grand Canyon, he divulged some little-known facts about the Hopi Indians—their life, occupations, and religion.

About 150 members were present at the YMCA Log Cabin for the birthday dinner meeting.

Die Engineer Explains Design for Deep Drawing

Louisville, Ky.—"Deep Drawing Dies" was the subject presented to Louisville Chapter, September 8, for the first meeting of the fall and winter series.

P. F. Rehner, Die Engineer, Carbide Alloys Div., Allegheny Ludlum Steel Corp., Detroit, Mich., was the featured speaker. He revealed himself as well informed both on steel and cemented carbide dies, especially in their application for small, accurate products.

Savings effected over die costs were discussed, and methods of holding and backing up the sets were thoroughly explained.

At the conclusion of his lecture, Mr. Rehner conducted a question and answer forum.

Chairman John A. Black presided and First Vice-Chairman N. H. Booker introduced the speaker.

Approximately 50 members and guests were present for dinner prior to the meeting. Attendance increased to about 100 for the technical program.

Past Chairmen Honored At Boston Function

Boston, Mass.—Past Chairmen's Night was observed at Boston Chapter September 9, with all former Chapter heads seated at the speakers' table. The guests of honor were: A. B. Forbes, C. A. Lockwood, J. W. Geddes, Warren Ames, H. J. Richards, A. A. Nichols, J. B. Savits and J. X. Ryneska.

Islyn Thomas, President of Thomas Mfg. Corp., Newark, N. J., and E. W. Spitzig, of Newark Die Co., collaborated on a presentation of "Injection Molding of Plastics."

Mr. Thomas, representing the plastics industry, claimed that 90% of all plastics are dependent on mold design and construction, frequent sources of trouble in plastics manufacture. The industry's greatest need is better dies at lower prices and faster delivery. He divided plastics into two groups, thermo-setting plastics and thermo-plastic materials.

Specialized Industry Developed

Molding equipment requirements have developed a large specialized industry employing thousands of machines. These in turn call for a vast amount of dies, fixtures and gages. An acute shortage of skilled toolmakers and die designers exists in this industry, which depends upon mass production for its sustenance.

Die shops, stressed Mr. Spitzig, should not be equipped with seldom-used special machines for engraving as this is a specialized branch of mold making. He warned against ill-advised hobbing methods resulting in trouble both for the plastic molder and the die shop.

Tool steel selection and heat treating are of utmost importance for successful molds, the speaker concluded.

Mr. Spitzig illustrated his lecture with slides, and conducted a question and answer period to clarify the hobbing technique.

C. Ross McKenney, outdoor technician of the Dartmouth Outing Club, opened the program with a humorous Canadian dialect monologue. A perennial favorite with the Chapter, Mr. McKenney makes an annual appearance before the group.

Nearly 150 members and guests attended the first meeting of the season.

Reports on Crisis Abroad

Richmond, Ind.—Landrum R. Bolling, recently returned to the United States from Europe where he was director of the Berlin office of the overseas news agency, was guest speaker at a meeting of Richmond Chapter, September 14.

His talk, "The Crisis in Europe," answered many questions paramount in the minds of Americans. While abroad Mr. Bolling not only met leaders of many European countries, but was also in close contact with people of all classes.

His information indicated complete understanding of conditions and problems confronting us, and the dangerous ideologies which threaten the world. He has now accepted the position of Professor of Political Science at Earlham College, Richmond.

T.L. Termed 'Watch Dog' Of Firm's Tool Dollars

Elmira, N. Y.—Warning every tool engineer that he is the "watch dog of his company's tool dollars," Earl H. Daugherty, Service Engineer for Whitman & Barnes Co., Chicago, Ill., told Elmira Chapter fundamentals of reducing costs where cutting tools are concerned. Mr. Daugherty was guest speaker at a meeting September 13 in the Mark Twain Hotel. His subject was "Drill and Reamer Applications."

E. H. Daugherty

With sketches he pointed out trouble spots to guard against in keeping down drilling and reaming costs, showed ways of getting maximum tool life, and gave tips on design of jigs and bushings.

Late developments in carbide tipped drills and reamers for use on hardened steel were explained, as well as methods involved and value of chrome-plating cutting edges.

A lively floor discussion with Mr. Daugherty followed the lecture.

Varner T. MacRorie of the Education Committee presented a set of Bern drafting instruments to Joseph Jesiczek, an Elmira Free Academy student, and a set of engineering books, "Jig and Fixture Design," to Gordon Dennis of Ithaca High School.

The awards were first and second prize, respectively, in the Chapter's second student contest in Tool Design. The contest is conducted annually to reward meritorious students and to further interest in the tool engineering profession among young people.

No War, Says Editor Russia Just Bluffing

Rochester, N. Y.—Russia is only bluffing—there is no war in immediate prospect. So L. R. Blanchard, General Executive Editor of Gannet Newspapers, believes after observing conditions in postwar Europe.

In discussing "Our European Front," September 9, before Rochester Chapter, Mr. Blanchard also expressed the opinion that the Germans seem completely whipped. They do not care what happens—all they want is food and shelter. Most of the Ruhr Valley and practically all of Berlin were completely wrecked, he added.

England, Mr. Blanchard found, still resists mass production, employing many hand operations where machines could be used. But France appears to have a great potential once its government is settled.

As illustration, the speaker showed color films of France, Germany, and Nuernberg Trial scenes. Following his address, he answered questions from the audience.

At the conclusion of the program, a buffet supper was served. The social meeting opening the fall season was attended by 135 members and guests.

Our Society

By HARRY E. CONRAD, *Executive Secretary*, ASTE

A word about registration fees at national meetings seems to be very much in order at the present time.

Many members complain over having to pay a registration fee when attending a national meeting. Many not only complain but some squawk like ——. I have yet to meet the complaining member who, after the why and wherefore of the registration fee was explained to him, didn't willingly concede it was the right thing to do.

Here is my explanation and I hope no one is offended.

Expense Is Considerable

First of all, there are some very definite costs involved in putting on a national meeting. Starting out with the pre-organization costs, the local Chapter Committee Members incur some expenses which cannot justifiably be charged to the local Chapter. Then there are tickets, programs and such that have to be printed plus the costs for buses for the plant tours. These all add up to a considerable item of expense which we would not normally incur if there was no meeting.

Many members feel that their yearly dues should entitle them to participate in the national events without an additional registration fee. Completely aside from what the regular member receives in direct return from his dues, perhaps the question can well be answered by a question. Why should the member who is less fortunate and unable to attend a national meeting be expected to help defray the expenses of those who are more fortunate and are able to attend these meetings?

The Society's income is limited to a very few restricted sources and, in comparison with the costs of the various activities sponsored, is altogether too limited to permit any extended service without additional income.

Service Contingent On Income

As reported in the Executive Secretary's Semi-Annual Report to the Board of Directors, the demand for member service should be our first consideration. The very makeup of the Society and its objectives make it imperative that the service the organization renders as a Technical Society not alone be expanded but continually improved and that, in order to do this effectively, more income is required. The Society has two major sources of income—dues from members and other income. Ways must be provided to increase other income so as to provide funds for any expansion in service.

The need for additional income has been recognized ever since the inception of the Society and other sources of income have been investigated—some of which have been adopted and, those that have been adopted, have met with varying success as, for example, the Tool Engineers Industrial Exposition is an example of a success—the ASTE Directory is an example of a failure. I say the ASTE Directory is an example of a failure only as a source of supplying additional revenue.

Other means have been and still are being considered and, most certainly, upon the publication of the Handbook, this activity will provide an additional source of income as well as textbooks some of which are now in process and others contemplated.

Injection Molding Tooling Highlights Plastics Talk

Toronto, Ont.—Speaking before a capacity audience of Toronto members, September 1, N. C. Taylor, of Tennessee Eastman Corp., Kingsport, Tenn., unfolded the story of the making of the plastic, Tenite. The engineers heard him also describe molds and designing methods used to produce molds for injection molding, with emphasis on common causes of tool failures.

As Service Engineer for the Tenite Sales Dept., Mr. Taylor has assisted in the design, construction and operation of many tools used in the plastics industry. With interest in injection molds and plastics now at a high peak, the group found his lecture very timely.

A sound motion picture, "The Story of Tenite," carried the audience through the complete manufacturing process.

Chairman John Lengbridge presided and urged action on the drive for new members.

During the coffee hour the members saw their own athletic prowess in a motion picture of the Chapter's summer Field Day. The film is available for loan to other Chapters.

Adams and Hauer Present Impact Forming Program

York, Pa.—R. N. Adams and E. J. Hauer of the Titan Metal Manufacturing Co., Bellefonte, Pa., were guest speakers at the first fall dinner meeting of Central Pennsylvania Chapter held September 23 at Bierman's Restaurant.

Color motion pictures were shown depicting "Impact Forming of Brass and Bronze Products." The speakers subsequently discussed extruding, drawing, forming and machining unusual metal shapes.

Congressman Chester H. Gross put in an unexpected appearance while searching for another group he was scheduled to address. The legislator was encouraged to make a few remarks and did so, urging the engineers to continue their important work.

Janmat Officer Explains Tool Reserve Procedure

Chicago, Ill.—Operation of Janmat, the joint Army-Navy Machine Acquisition Teams, and its relation to the National Industrial Equipment Reserve were explained to Chicago Chapter members, September 13, by William M. Livingston, Janmat Control Officer of the Chicago area.

In July of 1946, said Mr. Livingston, the armed services were holding 20,500 machines, while statistics indicated that approximately 66,000 were considered adequate, plus equipment being used in arsenals throughout the country.

The additional 45,000 machines were made available to the Armed Services by the War Assets Administration, through Congressional legislation permitting them to withdraw equipment on a non-reimbursable basis.

No Priority On Scarce Items

However, equipment that had been offered to the public could not be withdrawn by the services, after being programmed by the disposal agency or set up for bid procedure. Neither could short supply items be commandeered and handicap industry in its reconversion problems.

By the end of 1947, the War Mobilization and Reconversion Office had submitted to the Janmat Control Committee the first firmed listing preparatory to the original master listing of equipment desired by the services. The nation was divided into 21 areas, with officers to administer the program in each area.

Property screened at the Washington level of Janmat is earmarked and certified as existing and in good condition. It is then "frozen," allocated to a specific claimant division, and consigned to a storage area.

The quota has been stepped up to 180,000 machine tools, approximately 90,000 of which already have been shipped and stored, along with thousands of dollars worth of spare parts.

Profits By Experience

Action of the government in securing these machines will avert a situation such as it faced immediately following Pearl Harbor.

Millions were spent in rehabilitating equipment that had served in World War I. With the assistance of tool engineers, many of these machines were completely revamped and modernized almost beyond recognition.

A nearly disastrous factor in war production was that during depression years the trade did not have actual production problems to solve, always an aid in development and production of machinery when the country is operating on a full-time peace production basis.

Wherever possible, the speaker stressed, the government has endeavored to return scrap machinery to the mills, aiding industry in securing raw material for the production of machinery. Likewise, it has rid the market of machines ranging in age from 20 to 50 years, thereby making room for new equipment to enter industry.

Tool and Die Institute Meets With N. Y. Group

New York City—A joint meeting with the New York Tool and Die Institute, opening feature of the season for Greater New York Chapter, was held September 15 at Hotel New Yorker.

Chief speaker was Centre W. Holmberg, National Director of the Tool and Die Institute, and President of A. W. Holmberg Co. of New York. He discussed "Writing Tool and Die Specifications," a subject of perennial controversy between shop and engineering department.

Centre W. Holmberg, president, A. W. Holmberg Co., New York, discusses writing of tool and die specifications from viewpoints of shop and engineering personnel at joint meeting of Greater New York Chapter and New York Tool and Die Institute in Hotel New Yorker

Shop personnel, according to the speaker, claims that the tool designer fails to give complete data with the design, with a resulting loss of valuable time. The designer, on the other hand, accuses the toolmaker of uncooperation.

After considerable discussion, it was recommended that a standard be arranged to govern specification writing.

Julius Schoen, First Vice-Chairman of the ASTE Chapter, announced a series of attractive programs for the 1948-49 season. The next meeting is scheduled for December 7, when Islyn Thomas, Consultant and Manager, Thomas Mfg. Corp., Newark, N. J., will address the Chapter on "Modern Methods in Tooling for Plastics."

A large delegation was present from the guest organization.

Vetter Now Consultant

Ann Arbor, Mich.—A. A. Vetter of Detroit Chapter, ASTE, has been appointed Consulting Sales Engineer for the Buhr Machine Tool Co.

Eighteen years ago Mr. Vetter started with the Buhr Co. as a sweeper. Shortly thereafter, he began working on machine tools and has spent some time in almost every capacity in the plant. For the past seven years, he has been Plant Superintendent.

Thorly, Low Score Golfer At Twin States Outing

Springfield, Vt.—Twin States Chapter held their annual outing at the Windsor Country Club, Windsor, Vt., September 18. Eighty-nine members and guests enjoyed a full day of golf and other competitions for prizes, followed by a banquet in the club house.

Golf was the main feature of the day. Francis Thorly of Hy-Pro Tool Company, New Bedford, Mass., shot a 76 for low gross winner. Ray Griffen and Robert Jones of Jones & Lamson took first and second places for the longest drives. Chapter Chairman William Hadfield, of Fellows Gear Shaper, and Waldo Roston, of Jones & Lamson, placed first and second respectively in the putting contest.

Another major event was a four-inning soft ball game between teams captained by Harold Noyes of Jones & Lamson and Chairman Hadfield. The Noyes team won by the score 7-3.

Following the sports program and dinner, group singing was enjoyed to the accompaniment of Waldo Roston at the piano. During the evening Entertainment Chairman F. J. McArthur presented awards to winners of the various contests and distributed door prizes.

Guests included V. H. Ericson, Third Vice-President of ASTE, who spoke briefly on the program being arranged by the Society and on the construction of a headquarters building in Detroit.

Other guests were present from St. Johnsbury, Vt.; Franklin, Laconia, Manchester and Keene, N. H.; Grafton, New Bedford, Springfield and Worcester, Mass.; Dayton, Ohio; Chicago, Ill.; Amsterdam, Holland; and Rio de Janeiro, Brazil.

Tr[illegible] Through Steel Plant Hi[illegible]lights Casting Talk

H[illegible]lton, Ont.—Dominion Foundries & S[illegible]l Co. were hosts to Hamilton Cha[illegible]r. September 10, when 90 mem-ber[illegible]d guests were conducted through a m[illegible]rn foundry, machine shop, plate, strip [illegible]nd tin mills.

St[illegible]rting in the foundry, with its electric [illegible]rnaces and open hearth charging floor, the tour led to the rolling mill. Here billets a foot thick are conveyed from continuous furnaces to the rolling machine. After several passes through this machine, they emerge as plate 1¼" thick. The plate is run through another set of rolls which reduce it to 5/16".

After cooling in a third set of rolls, the metal is cut into strips. In the final rolling before annealing, the steel is flattened to the desired thickness, in this instance .0096".

Annealing takes place in an automatic furnace with closely controlled temperature. Atmosphere is excluded to prevent the steel from turning blue. In the next operation the stock is slit to proper width while a magic eye inspects surface condition and thickness. A rotary knife cuts it to length, and it moves to a stacking point.

The visitors saw the sheets immersed in pickling baths and water tanks, followed them to the tin plating tanks, and finally to the weighing and shipping room, air conditioned to remove excess moisture, thereby preventing rust.

At the conclusion of the tour, the party proceeded to Fischers Hotel for a social hour, dinner, and technical session.

W. D. Lamont, Superintendent of Rolling Mills for the Dominion concern, discussed "Trouble Shooting on Steel Fabrication and Castings." Treating the design and application of steel castings, he cited many instances where the use of such castings improved the product structurally as well as economically. In the subsequent open forum, Mr. Lamont seemed at his best, answering questions from the floor.

Harry Whitehall, a former Chairman, introduced Mr. Lamont and George Prouse thanked him and his company for their contribution to the Chapter program.

Advocates Management Principles for World Affairs

Pittsburgh, Pa.—Our stake in European recovery is a stake in a better way of life through application of sound management principles to national and international affairs. So H. B. Maynard, President of Methods Engineering Council, Pittsburgh, stressed in an address, September 17, before Pittsburgh Chapter.

Mr. Maynard's talk was a report on a recent visit abroad where he spent several months studying conditions and attending various management and engineering conferences.

European business management, he found, admires the sagacity of American taxpayers in supporting the Marshall Plan to restore the economy of the Continent and thus benefit themselves.

In France he observed conditions as definitely improved. The Communist threat is lessened, currency has been devalued to near its true worth, and the wheels of industry and commerce are turning faster.

The French people are very critical of their government as are subjects of Great Britain and Sweden. English travelers told Mr. Maynard that coming into France was like entering Paradise, after the austerity in Britain. They take a dim view of their present government and hope for a change.

Swiss Are Hard Workers

Relatively untouched by the war, Switzerland is economically sound and has one of the few hard currencies remaining in the world. The Swiss work harder than people in any other country visited by the speaker, therefore their position is extremely favorable.

Sweden, on the other hand, is not as well off as when it emerged from the war, intact and with about $800,000,000 in U. S. funds. As they shamefacedly admit, they spent their dollars foolishly for soft goods like cigarettes and cosmetics, instead of buying machinery and materials for production.

Everywhere in Europe Mr. Maynard saw evidence of man-made economic barriers, prompting him to ask everyone he met whether they favored a United States of Europe. Without exception, even from the English who were formerly lukewarm toward the idea, he found strong sentiment in favor of some sort of union.

In fact, most engineers and management people saw it as the only possible solution to their economic difficulties. Elimination of national boundaries, they emphasized, would result in wider markets and larger production units.

Inquiries about the language problem in such a setup disclosed a popular leaning toward adoption of English as the universal language.

Not Hopeful About United Europe

In spite of the desire for a United States of Europe, no one interviewed seemed particularly hopeful that it would materialize in the near future. Nationalism plus the self-interest of the politicians would prevent it, they all felt.

Favorable factors mentioned were: (1) the positive influence of the United States, particularly in connection with the Marshall Plan; (2) possible forced action through economic necessity; and (3) the ever-present threat of engulfment by Russia. In general, these people did not think war as likely as many do here.

Asked if they thought the Marshall Plan would help, the reply invariably was, "It is already helping."

Plant managers in four countries—France, Denmark, Holland and Sweden—stated that their companies were making too much money, as prices are fixed by government regulation based on the profit ability of the least efficient unit of the industry.

Progressive units, usually the largest, therefore make so much money that they are literally ashamed. If they lowered prices, "our colleagues in the industry would never speak to us again." The competitive spirit as we know it apparently does not exist abroad.

Must Offset Manpower Shortage

According to a survey by the United Nations Department of Economic Affairs, Europe's manpower problem will necessitate increased production per man hour until prewar levels are attained. But Europe must be much more productive than it ever was before the war. In addition to the machines and raw materials being furnished under the Marshall Plan, the best possible management must be provided.

This, Mr. Maynard commented, applies at home as well as abroad in order to advance the material prosperity of the world and raise standards of living, provide better wages, lower costs, and greater leisure. But the supreme challenge for scientific management, he concluded, will be met when managers of countries eliminate the obstacle of war and provide incentives which will result in lasting world peace.

Dinner and a business meeting preceded the principal address. After dinner the Harmoneers quartet entertained with vocal and comedy selections.

Chairman W. S. Risser presided and First Vice-Chairman Frank Boyd introduced the speaker to the 82 members and guests present.

W. D. Lamont's repartee during discussion from floor at Hamilton Chapter meeting amuses speakers' table. From left: Harry Whitehall, past Chairman, Mr. Lamont (technical speaker), Supt. of Rolling Mills, Dominion Foundries and Steel Co.; Gordon Hall, Chairman; L. Blinkensop, W. M. Shaw, and George Gilmore, 1st Vice-Chairman

Coming MEETINGS

CEDAR RAPIDS—November 17, 6:30 P. M., Montrose Hotel. Speaker: Kenneth N. Macomber, Chief Engineer, LaPointe Machine Tool Co., Chicago. Subject: "Latest Developments in Surface Broaching."

DETROIT — November 11, Rackham Education Memorial Bldg. Dinner, 6:30 P. M.; meeting, 8:00 P. M. Speaker: Capt. Leon Jacobi, Chief of Naval Reserve, Detroit Area. Subject: "National Defense and the Naval Reserve." December Christmas Stag, Book-Cadillac Hotel. January 13, 1949. Speaker: Herman Goldberg, Snow Mfg. Co., Chicago. Subject: "Observations on High Speed Drilling and Tapping."

ELMIRA—December 6, 7:00 P. M., Mark Twain Hotel. Speaker: Norman H. Iversen, Michigan Broach Co., Detroit, Mich. Subject: "Broaches and Broaching."

FOND DU LAC—November 12, 6:30 P. M., Conway Hotel, Appleton, Wis. Speaker: Miss Beth Dailey, Executive Secretary, Oshkosh Chapter American Red Cross. Subject: Travelogue on Japan, with colored films, based on wartime experiences with the Red Cross.

NEW YORK, GREATER—December 7. Speaker: Islyn Thomas, Consultant and Manager, Thomas Mfg. Corp., Newark. Subject: "Modern Methods in Tooling for Plastics." January 3, 1949. Speaker: Philip M. McKenna, President Kennametal, Inc., Latrobe, Pa, Subject: "Carbide, Its Development and Application in the Machine Tool Industry."

NIAGARA DISTRICT — December 2 at St. Catharines. Speaker: Adam Gabriel, Acme Industrial Co., Chicago. Subject: "Light Waves and Their Uses in Precision Shop Measurements."

RACINE—December 6, 6:30 P. M. Racine Manufacturers Bldg. Speaker: E. B. Rhodes, Industrial Sales Representative, Bendix-Westinghouse Mfg. Co., Elyria, Ohio. Subject: "Air Operated Holding Devices." January 10, 1949, 6:30 P. M., Racine Manufacturers Building. Speakers: Ray P. Kells, Chief Service Engineer, and Stewart G. Fletcher, Chief Metallurgist, Latrobe Electric Steel Co. Subject: "Modern Developments in Heat Treating and Production of Tool and Die Steels."

TORONTO — December 1. Subject: "Carbides," sponsored by Canadian General Electric Co., Ltd., A. C. Wickman, Ltd., and Kennametal Co., Ltd. January 5, 1949. Subject: "Modern Trends in Machine Tool Design," sponsored by Modern Tool Co.

TRI-CITIES—December 1, Ladies Night. January 5, Plant visitation, J. I. Case. Co., Bettendorf Plant.

Air-Powered Devices Cut Cost of Manufacturing

Erie, Pa.—Economies in production, time and costs, through air-operated equipment to clamp and hold production pieces in jigs and fixtures, were demonstrated to Erie Chapter members in a series of slides presented September 7 by E. B. Rhodes of Bendix Westinghouse Automotive Air Brake Co.

During his discussion of air operated devices, Mr. Rhodes showed films illustrating the use of air brakes and their contribution to highway safety.

The technical program concluded with a question and answer period which further clarified the use of air-powered apparatus in industrial plants.

Chairman Vincent Peck presented a Past Chairman pin to M. H. Hetzel in recognition of his leadership through the 1947-48 season.

Thirty members and guests attended the first fall meeting and preceding dinner at the General Electric Community Center building in Erie.

Golden Gate Sees Cans Roll Off Production Line

San Francisco, Calif.—An afternoon plant tour of the San Francisco General Line factory of American Can Co. was attended by 125 members and guests of Golden Gate Chapter, September 14, in conjunction with their monthly meeting.

The plant visited manufactures all types of specialty lithographed containers such as beer, coffee, and spice cans, and cans of irregular shape. Those attending had an opportunity to watch the intricate machinery producing containers, beginning with the sheet tin as it is lithographed, baked, stamped and formed into a finished product in a fast, continuous cycle. This plant alone turns out 215 million beer cans annually.

On a floor devoted to making sanitary milk cartons, the visitors saw the entire process from the printing of paper stock, fed into presses from huge rolls, to cutting, forming and waxing. All operations are automatic, and the container comes from the line thoroughly parawaxed, chilled and sealed. This department produces approximately 300 million containers annually to supply milk distributors in the area.

After the tour dinner was served in the plant cafeteria, followed by a business meeting.

D. C. Richardson, Assistant Plant Manager, reviewed and explained operations seen during the tour. Robert Spence, Can Line Foreman, answered questions and elaborated on Mr. Richardson's talk.

New Headquarters Address:

American Society of Tool Engineers
10700 Puritan Ave. Detroit 21, Mich.

Speeds of 8000 FPM Credited to Carbide Dies

Williamsport, Pa.—With tungsten carbide dies, speeds of 8,000 feet per minute can be attained in wire drawing, M. F. Judkins, Chief Engineer, Carbide Div., Firth Sterling Steel & Carbide Corp., pointed out in an address, "Sintered Carbide Tools and Dies," before Williamsport Chapter, September 13.

M. F. Judkins

Tungsten carbide, Mr. Judkins explained, is three times as hard, twice as dense, and about two and three-fourths times as rigid as steel. In the sintering process, the volume shrinks 48%. An 0.15 microinch finish can be obtained on gage blocks of this material. Not limited to tools and dies, it is used also in product manufacture.

Punches and dies of tungsten carbide, said the speaker, have five to ten times the life of steel, with little tendency for pick-up. Wet grinding was recommended as advantageous by eliminating dust and producing a better finish.

Coffee speaker was Comm. Donald D. Wolfe, U. S. Naval Reserve officer on active duty at the Williamsport Naval Armory. Goal for the Naval Reserve, said Commander Wolfe, is 2,000,000 men with 10 per cent on active reserve status. Radio, radar and electronics dominate the ratings available in naval armory assignments. In time, he remarked, a Naval Reserve will become an economical means of maintaining military training.

Delbert Lowrey, Chapter Chairman, presided and Edwin Sears, Program Chairman, presented the speakers.

Heat Treat Talk Featured

Milwaukee, Wis.—Dr. Stewart G. Fletcher, Chief Metallurgist of Latrobe Electric Steel Co., Latrobe, Pa., addressed Milwaukee Chapter, September 9, on "Selection and Heat Treatment of Tool and Die Steel."

Immediately following the slide-illustrated lecture, Ray P. Kells, Chief Service Engineer at Latrobe, conducted an open discussion and answered questions from the floor.

N. R. Davis, Jr., representing the Underwriters' Laboratory of Chicago, gave the coffee talk, "Testing for Safety."

Chairman Joseph Ebner welcomed the approximately 125 men present and introduced the technical speakers. Program Chairman Arthur Gudert presented the coffee speaker. The meeting, held at the Elks Club, was the first of the fall season.

Tool Film Shown

Providence, R. I.—A film, "Machine Tools in Motion," was the feature attraction of a meeting of Little Rhody Chapter, September 15, at Oates Tavern.

More than 100 members and guests attended the dinner and meeting and renewed acquaintances after the summer lapse of activities. A sports film concluded the program.

GOOD READING

A Guide to Significant Books and Pamphlets of Interest to Tool Engineers

PROFESSIONAL REGISTRATION LAWS AND THE ENGINEER, by **A. M. Sargent**, past President of the ASTE, is an unbiased study and analysis of the laws of the various states for governing the registration of professional engineers.

Mr. Sargent is a registered professional engineer and president and general manager of the Pioneer Engineering & Manufacturing Company. Having personally had unusual opportunity to study the values and the fallacies of the "professional engineering" designation, he has spent many months of research in assembling the facts, the history of the practice of registering engineers, the various state laws, related court findings, and the case histories of men who experienced both success and failure in applying for license to use the title.

In recognition of the possible future implications of these laws and their inefficiencies, Mr. Sargent's pamphlet suggests remedies and revisions to eliminate future injustices and inequities. The subject is of vital concern to every engineer, regardless of the branch of engineering in which he is engaged, and every engineer should avail himself of the opportunity to become conversant with the good features and the bad ones of our registration laws.

The pamphlet, published on a non-profit basis, is available at $ .75—or less, for quantity orders—from **A. M. Sargent**, 19669 John R Street, Detroit 3.

DIAMOND TOOL PATENTS II, Diamond Abrasive Wheels, edited by **P. Grodzinski**, is a review of patents dealing with diamond abrasive wheels. Abstracts of about 400 British, American, German, and other patents are thus presented in numerical order.

The introduction includes a short history of the development of diamond abrasive wheels and an analysis of the principal types of bond—metallic, resinoid, and vitrified. All patents are listed in a table for cross-reference purposes, with each patent number identified by year and type of bond.

A second table lists all patents for each subdivided class of wheel bond. The Appendix includes abstracts on the more important patents related to the production and use of loose diamond abrasive and an alphabetical index of patentees and the numbers assigned to them.

This 52-page pamphlet is a companion piece to the 1945 survey of patents for diamond tools for machining metals and non-metallic substances. The present pamphlet is available at **$1.40** from *Industrial Diamond Information Bureau*, 32-34 Holburn Viaduct, London, E. C. 1, England.

GERMAN NON-FERROUS FOUNDRY INDUSTRY is a 131-page report prepared by British investigators of German copper-base, non-ferrous sand foundries. The report describes practices observed at 18 German firms, particularly in respect to centrifugal casting methods.

The coating of steel gear wheels with bronze by a casting process is cited as one of the most important processes developed in German industry, and came about through the shortage of tin required for ordinary sand casting methods.

The report (PB-34011) may be obtained from the *Office of Technical Services*, Department of Commerce, Washington, D. C. The report is priced at $3.50, and checks should be made payable to the Treasurer of the United States.

FREE BOOKLETS AND CATALOGS CURRENTLY OFFERED BY MANUFACTURERS

Lubrication, Centralized

Booklet describes in detail the Grannan lubricator valve for single line centralized lubrication. Machines having many bearings, or batteries of machines, may be served from one inlet, manually or automatically. A small and compact lubricator at each bearing delivers the correct predetermined amount by controlled hydraulic pressure. Safety and maintenance cost factors are analyzed. *Titeflex, Inc.*, 641 Frelinghuysen Ave., Newark 5, N. J.

Machine Tools

Catalog G-48 describes, illustrates, and gives detailed specifications for the Sheldon precision lathes, shapers, and milling machines, with many accessories and attachments also included. The featured 12-inch backgeared shaper offers many refinements ordinarily found only in larger, more costly models. *Sheldon Machine Co., Inc.*, 4258 N. Knox Ave., Chicago 41.

Meehanite Design Data

Bulletin 27 and Supplement offer many design data formulae and charts for computing maximum stresses in angles, ribbed plates, and shear resistant webs containing cutouts. *Meehanite Metal Corp.*, Pershing Sq. Bldg., New Rochelle, N. Y.

Metallizing Equipment

Catalog 401 covers, in condensed form, the complete line of Metco metallizing equipment and supplies. Included are guns, air and gas controls, wire control units, spray booths, dust collectors, safety equipment, blast machines, and air compressors. *The Metallizing Engineering Co., Inc.*, 38-14 30th St., Long Island City 1, N. Y.

Mounted Wheels & Points

Catalog outlines the many Radiac mounted points and wheels, covering a wide range of shapes and sizes, and available with aluminum oxide or silicon carbide in vitrified, resinoid, or rubber bond, and also available in extra-cool running Por-os-way cellular structure. Wheels are mounted on standard plain mandrels from 3/32 to 5/16 in., and threaded mandrels from $\frac{1}{8}$ to $\frac{1}{4}$ in. *A. P. de Sanno & Son, Inc.*, Phoenixville, Pa.

Presses, Hydraulic

Bulletin 4804 is a pictorial and descriptive review of the complete H-P-M line of hydraulic presses for metal drawing, forging, forcing, straightening, powder metallurgy, briquetting, extruding, and other purposes, also die casting, injection molding, and other machines. *The Hydraulic Press Mfg. Co.*, Mount Gilead, O.

Resolvers, Electrical

Folder describes line of compact, precision electrical resolvers designed specifically for electromechanical computing and control equipment, where they provide an accurate and dependable means of solving intricate problems involving the trigonometric functions. *Arma Corp.*, 254-36th St., Brooklyn 32, N. Y.

Saw, Diamond Band

A four-page technical report on the contour sawing of hard metals and vitreous materials with the recently-developed diamond band sawing machine gives detailed data on operating procedures and typical applications. Among materials successfully sawed with the diamond-studded band saw have been glass, granite, tungsten carbide, ceramics, and others. *The DoAll Company*, Des Plaines, Ill.

Scales, Weighing & Counting

Six 3-color technical bulletins—totaling 68 pages—offer detailed data on counting bench, portable platform, dormant platform, and crane scales. The bulletin on counting scales is unusually complete with operating instructions. Mr. R. F. Miller, *The Yale & Towne Mfg. Co.*, 4530 Tacony St., Philadelphia 24.

Screw Thread Inserts

Booklet of 12 pages offers the latest design data, specifications, and installation instructions for the Heli-Coil line of screw thread inserts. Used in original equipment, salvage and maintenance, inserts provide hard, smooth, stainless steel thread surfaces in all metals, plastics and wood for cap screw, stud, pipe thread, and spark plug assemblies. *Heli-Coil Corp.* (formerly

Aircraft Screw Products Co., Inc.), 47-23 35th St., Long Island City 1, N. Y.

Second Operation Machine

Bulletin DSM 59 fully illustrates and describes the High Speed Precision Second Operation Machine, its tooling dimensions and floor plan, construction details, and tooling accessories. *Hardinge Brothers, Inc.*, Elmira, N. Y.

Shears, All-Steel

The 32-page Catalog S-5 highlights the many features of the Cincinnati line of shears which cut sheet metal to micrometer accuracy. Low shear angle, hydraulic hold-downs, heavy steel plate construction, light beam shearing gage, and many mechanical refinements are among the features described in detail. *The Cincinnati Shaper Co.*, Cincinnati 25, O.

Special Machines

"Production News from Snyder", a folder, presents the latest special machinery built by this company. Included is a transfer type machine that automatically completes 11 operations in 48 seconds. Another drills and faces 444 piston heads an hour. *Snyder Tool & Engineering Co.*, 3400 E. Lafayette, Detroit 7.

Spray Booths

Catalog 480 gives detailed information on the Centri-Merge spray booths for removal of paint overspray, with photographs and blueprints of typical plant installations. Catalog 481 covers the general field of equipment built by Schmieg, including dust and fume control units, spray booths, conveyor-type washers, ovens, and other units. *Schmieg Industries, Inc.*, 329 Piquette Ave., Detroit 2.

Surface Finish Standards

Bulletin 1048 describes machine-cut surface finish standards and their use. These standards cut from stainless steel offer long life without corrosion or wear. The pocket set includes 20 specimens and the master set 23 specimens. Both sets range from 2 to 500 microinches. *Edward Blake Co.*, 437 Cherry St., West Newton 65, Mass.

Taps, Collapsing

Bulletin S-4 describes the improved Class S Geometric collapsing taps, featuring universal application to most standard machines, and readily converted from one type of trip to another. Other notable points are generous chip space, full flow of coolant to chasers, rigid chaser support throughout, and many others. *The Geometric Tool Co.*, New Haven 15, Conn.

COMING EVENTS

Nov. 14-17. ANNUAL MEETING, National Food and Die Manufacturers Association, Hotel Schroeder, Milwaukee, Wis.

Nov. 28-Dec. 3. ANNUAL CONVENTION, American Society of Mechanical Engineers, New York City.

Nov. 29-Dec. 4. EIGHTEENTH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING, Grand Central Palace, New York City.

North East West South

Eastern Cutter Corp., Newark 7, N. J., has been bought completely by its former president, **A. R. Abeel, Sr.**, who had sold his controlling interest in 1945 due to ill health. **Carl Abeel**, pres. of the **L. T. S. Cutter Co.** of Newark, also bought completely by A. R. Abeel, Sr., will be plant mgr. in the new organization, and **A. R. Abeel, Jr**, sales mgr.

A new entrant in the field of powder metallurgy is the **International Powder Metallurgy Co.**, with offices at Ridgway, Pa. Principals are **M. T. Victor**, pres.; **G. J. Hoehn**, vice-pres. in charge of production; and **E. C. Berger**, sec'y-treas.

The newly-organized **Shepherd Special Machine and Die Co.** has acquired the former Laeco, Inc. plant at 15215 Chatfield Ave., Cleveland, O. Officers are **M. O. Shepherd**, pres., formerly works mgr. for The Bunell Machine and Tool Co., Cleveland; **Dan E. Shepherd**, vice-pres.; and **Dick A. Shepherd**, sec'y.

The Allmon Steel Co., with offices in the Arrott Bldg., Pittsburgh, Pa., and at Washington, D. C., has been formed as a sales company, dealing principally in special-purpose steels for both domestic and foreign markets. Principals —all formerly associated with Jessop Steel Co.—are **Fred T. H. Youngman**, pres.; **T. W. Pennington**, exec. vice-pres. and treas.; and **R. A. Parks**, gen'l mgr. of sales.

The entire common stock equity in **Vascoloy-Ramet Corp'n**, Waukegan, Ill., manufacturer of tungsten carbide products, has been acquired by **Fansteel Metallurgical Corp'n**, Chicago, which supplies its rare metal materials and which formerly held two-thirds of its stock. Vascoloy-Ramet will continue to be operated under its own name, as a division of Fansteel.

A $3,000,000 plant, for the manufacture of single-phase motors and a vertical-type irrigation pump motor, is being built at San Jose, Cal., by **General Electric Co.** It will be completed in 1948 and operating at full production by early 1949.

In a recent reorganization of the Carbide Div. sales and manufacturing staff of **Firth Sterling Steel & Carbide Corp'n**, McKeesport, Pa., **L. G. Firth**, pres., assumed additional duties as director of technical development; **W. J. Leach**, mgr. of carbide development and quality control; **Charles W. Adams, Jr.**, mgr. of carbide production and fabrication at McKeesport; and **L. G. Moffat**, works mgr. at Milford, Conn.

A million-dollar expansion of laboratory and warehouse facilities for cold finished steel is nearing completion at the Pittsburgh Works of the **Jones & Laughlin Steel Corp.**

The **Ohio Knife Co.** of Cincinnati this year celebrates its 50th year of service to American industry.

The **Die-Mold Corp.**, specializing in the design and building of dies and molds for the die-casting, permanent mold casting, and plastics industries, has moved into its modern, new plant at 6619 Motor Ave., Milwaukee 13, Wis.

The Paraffine Companies, Inc., believed to be the largest Pacific Coast producer of floor coverings and building materials, has acquired 26 acres at Raritan, N. J., for construction of an Eastern plant. Under the management of **Irvin Hovgaard**, the plant will employ about 500 workers

Norton Company recently dedicated a new $4,300,000 manufacturing plant at Worcester, Mass. The plant was built especially to house the Norton-developed process of grinding wheel manufacture, by which ten million wheels have already been produced in pilot operations.

Frederick M. Bock, previously assistant to the works mgr. of Burroughs Adding Machine Co., has been appointed assistant to the president of **Pioneer Engineering and Manufacturing Co.**, Detroit.

E. W. Chapman, formerly with the Industrial Pump Div'n of Bowser, Inc., has been appointed vice-pres. in charge of eng'g at **Tuthill Pump Co.**, Chicago.

Frank T. Lewis, formerly ass't mgr. of the Schenectady Works, has been named mgr. of manufacturing in **General Electric's** Aeronautic and Ordnance Systems Division.

P. J. Jensen, formerly executive eng'r in the engineering and research dept., has succeeded **M. E. Knell** who recently retired as manager of the Michigan district for **Carboloy Company, Inc.**

IN INDUSTRY

William F. B. Henderson has been named executive vice president and a director of **E. W. Bliss Company**, press manufacturers of Detroit. Mr. Henderson formerly held the same position with Clearing Machine Corp., Chicago.

Recent changes at **The Carborundum Co.**, Niagara Falls, N.Y., included appointment of **E. B. Forse** as assistant vice president, with headquarters at Perth Amboy. His former duties as manager of the Refractories Division will be assigned to **C. E. Hawke**, who will be succeeded as director of sales by **E. R. Baxter.**

After 13 years of successful administration, **Henry J. Howlett** has resigned as secretary of the **American Management Association** to become president of **Container Laboratories, Inc.**, packaging and packing engineering consultants with offices in several leading cities.

James K. Fulks, who joined **Ex-Cell-O Corp.**, Detroit, in 1925 and has been vice president in charge of manufacturing since 1942, has been elected a director of the company. Other promotions include **John F. Miller** to sales manager of the Machine Tool and Cutting Tool Divisions, and **D. H. McIver** to sales manager of the Aircraft and Miscellaneous Parts Divisions. Both men have been with Ex-Cell-O since 1929.

Quaker Chemical Products Corp., Conshohocken, Pa., has let contracts for the provision of 20,000 sq. ft. additional plant space, in order to take care of rapidly expanding business.

Paul S. Strecker, assistant to the president, has been named works manager of the **Toledo Machine & Tool Divn.** of the **E. W. Bliss Company**, Detroit.

Economy Engineering Company, makers of portable materials handling equipment, and formerly located at 2653 W. VanBuren St., Chicago, have moved their entire manufacturing operations into a new plant at 4511 West Lake St., Chicago 24. The new plant offers double the former floor space and permits a more efficient layout of shop facilities.

S. C. Lawson, ASTE member, has been promoted to general sales manager of **Ampco Metal, Inc.**, Milwaukee, Wisc., succeeding **R. J. Thompson**, who will be engineering and sales head of Ampco's West Coast activities. **J. P. Henry**, eastern zone manager, will succeed Mr. Lawson as assistant general sales manager. **E. E. Whitson**, Philadelphia district manager, has become advertising manager.

B. N. Brockman, Jr. will continue in charge of the company's export sales while assuming responsibility as advertising manager of the **R. K. LeBlond Machine Tool Co.**, Cincinnati. He succeeds **Sidney R. Best** who has joined Perry-Brown, Inc., advertising agency, to be account executive for LeBlond and others.

Willis C. Toner, associated with Radio Division plants since 1930, has been named plant manager of **Sylvania Electric's** new television tube plant at Ottawa, Ohio.

George F. Mueller, patent attorney for the corporation since 1942, has been elected assistant secretary of **Fansteel Metallurgical Corp.**, Chicago.

G. O. Romig, with the sales organization since 1945, has been appointed sales manager of the Cleveland plant of the **Claud S. Gordon Company.**

J. C. Kuhn has been appointed general sales manager of **Morse Twist Drill & Machine Co.**, New Bedford, Mass. Mr. Kuhn had formerly been eastern district sales manager of Blackhawk Mfg. Co., and prior to that was associated with Van Norman Co.

Carl J. Lamb, prominent technical speaker and author, has been appointed consulting engineer at **The Hydraulic Press Mfg. Company**, Mount Gilead, O. Prior to his appointment, Mr. Lamb had been head of the eastern office of a prominent firm of consulting engineers in the machinery and equipment design field.

Lester B. Hamersley, who had been assistant sales manger of Signode Steel Strapping Co., has been appointed sales promotion manager for **Firth Sterling Steel & Carbide Corp.**

Samuel M. Gahagen, formerly with the Rustless Iron and Steel Corp., Baltimore, Md., has been appointed chief metallurgist by the **Jessop Steel Company**, Washington, Pa.

D. J. Erikson, who started with **Hagan Corporation** as draftsman over 30 years ago, has been elected president of Hagan and its subsidiary companies—Calgon, Inc., Hall Laboratories, Inc., and Burmin Company. He succeeds **J. M. Hopwood**, president since 1918, who has become chairman of the board of directors.

The **National Bureau of Standards** has announced appointment of **Dr. Robert D. Huntoon** as chief of the Atomic and Molecular Physics Divn. He had been with the Bureau since 1941 and was prominent in the development of the proximity fuse and numerous electronic devices. **Dr. Karl Kessler**, formerly of the University of Michigan faculty, has been appointed to the staff of the Atomic and Molecular Physics Division. **H. F. McMurdie**, a member of the Bureau staff since 1928, has been named chief of the Constitution and Microstructure Section, Mineral Products Divn.

OBITUARIES

H. William Kopf, manager of the Detroit office of **Pratt & Whitney** division of **Niles-Bement-Pond Co.**, died Aug. 13. Widely known in the industry, Mr. Kopf first joined Pratt & Whitney in 1902, coming to Detroit in 1910.

Carl A. Carlson, author, inventor, and sales engineer for **Norton Company** in charge of the Rough Grinding Section, recently died in an airplane crash near Winona, Minn.

Aldus C. Higgins, for nearly half a century closely identified with **Norton Company**, died recently in his home in Worcester, Mass. Prominent industrialist and philanthropist, he had started with Norton as patent counsel in 1900 and was chairman of the company's executive committee at the time of his death.

Directory of A.S.T.E. Chapter Chairmen

AKRON, NO. 47
Second Monday *
George A. Irwin, *Chairman*
243 Malacca Ave.
Akron, Ohio

ATLANTA, NO. 61
Third Monday *
George W. Brown, *Chairman*
Big A. Road,
Toccoa, Ga.

BALTIMORE, NO. 13
First Wednesday *
George A. Exley, *Chairman*
Bendix Radio Div.
E. Joppa Road, Towson
Baltimore 4, Md.

BINGHAMTON, NO. 35
Second Wednesday *
Roger E. Coles, *Chairman*
506 Mountain View Dr.,
Union, N. Y.

BOSTON, NO. 33
Second Thursday *
William W. Young, *Chairman*
Pratt & Whitney Div.
238 Main St.,
Cambridge, Mass.

BUFFALO-NIAGARA FRONTIER, NO. 10
Second Wednesday *
Garrett Kingston, *Chairman*
38 Schauf St.,
Buffalo 11, N. Y.

CEDAR RAPIDS, NO. 71
Third Wednesday *
Raymond E. Bextine, *Chairman*
Link-Belt Speeder Corp.
1201 Sixth St., S. W.,
Cedar Rapids, Iowa

CENTRAL PENNSYLVANIA NO. 22
Third Thursday*
Albert Anderson, *Chairman*
446 N. Duke St.,
Lancaster, Pa.

CHICAGO, NO. 5
First Monday *
Harold M. Taylor, *Chairman*
Supplies, Inc.
564 W. Adams St.,
Chicago 6, Ill.

CINCINNATI, NO. 21
Second Tuesday *
George H. Simon, *Chairman*
7 W. Pike St.,
Covington, Ky.

CLEVELAND, NO. 3
Second Friday *
Jack H. Schron, *Chairman*
Glenn Tool & Mfg. Co.
716 E. 163rd St.,
Cleveland 10, Ohio

COLUMBUS, NO. 36
Second Wednesday *
Albert W. Montague, *Chairman*
829 Vernon Rd.,
Columbus 9, Ohio

DAYTON, NO. 18
Second Monday *
E. J. Seifreat, *Chairman*
1006 Harries Bldg.,
Dayton, Ohio

DECATUR, NO. 58
Second Monday *
Fred W. Sobottka, *Chairman*
1620 E. Cleveland Ave.,
Decatur, Ill.

DENVER, NO. 77
First Wednesday *
Ben J. Hazewinkel, *Chairman*
4555 E. 17th St.
Denver 7, Colo.

DETROIT, NO. 1
Second Thursday *
Andrew Carnegie, *Chairman*
2970 W. Grand Blvd.,
Detroit 2, Mich.

ELMIRA, NO. 24
First Monday *
James F. Deegan, *Chairman*
Lower Maple Ave.,
Elmira, N. Y.

ERIE, NO. 62
First Tuesday *
Vincent Peck, *Chairman*
1110 W. 30th St.,
Erie, Pa.

EVANSVILLE, NO. 73
Second Monday *
Clyde E. Yost, *Chairman*
700 Villa Dr.,
Evansville, Ind.

FAIRFIELD CTY., NO. 6
First Wednesday *
William C. McDonough, *Chairman*
R.F.D. 2, Danbury Rd.,
Wilton, Conn.

FLINT, NO. 68
Third Thursday
Ralph W. Cook, *Chairman*
1037 Gladwyn,
Flint 4, Mich.

FOND DU LAC, NO. 45
Second Friday *
Jule P. Schommer, *Chairman*
59 Polk St., Oshkosh, Wis.

FORT WAYNE, NO. 56
Second Wednesday *
Leonard Roebel, *Chairman*
206 E. Sherwood Terrace,
Ft. Wayne, Ind.

FOX RIVER VALLEY, NO. 72
First Tuesday *
Roger F. Waindle, *Chairman*
123 So. Jackson Ave.,
Batavia, Ill.

GOLDEN GATE, NO. 28
Third Tuesday *
Ernest C. Holden, *Chairman*
3122 Guido St.,
Oakland 2, Calif.

HAMILTON, NO. 42
Second Friday *
Gordon Hall, *Chairman*
29 Nelson Ave.,
Burlington, Ont.

HARTFORD, NO. 7
First Monday *
William F. Jarvis, *Chairman*
Chas. L. Jarvis Co.
Pease Ave.,
Middletown, Conn.

HOUSTON, NO. 29
Second Tuesday *
Dean Saurenman, *Chairman*
Baker Oil Tools, Inc.
Box 3048, Houston 1, Texas

INDIANAPOLIS, NO. 37
First Thursday *
Clarence M. Wetzel, *Chairman*
4910 E. 12th St.,
Indianapolis, Ind.

KANSAS CITY, NO. 57
First Wednesday *
F. Ward Osborn, *Chairman*
819 West College,
Independence, Mo.

LITTLE RHODY, NO. 53
Third Wednesday *
Robert B. Parker, *Chairman*
76 Ferncrest Ave.,
Edgewood, R. I.

LOS ANGELES, NO. 27
Second Thursday *
Leslie F. Hawes, *Chairman*
2616 W. 78th Pl.,
Inglewood, Calif.

LOUISVILLE, NO. 54
Second Wednesday
John A. Black, *Chairman*
3733 N. Western Pkwy.,
Louisville 12, Ky.

MADISON, NO. 75
1st Tues. After 1st Mon. *
Lorenz A. Leifer, *Chairman*
13 Oxford Pl.,
Madison 4, Wis.

MID-HUDSON, NO. 74
Second Tuesday *
Llewellyn H. Tenney, *Chairman*
76 Grand Ave.,
Poughkeepsie, N. Y.

MILWAUKEE, NO. 4
Second Thursday *
Joseph Ebner, *Chairman*
4224 N. 36th St.,
Milwaukee, Wis.

MONTREAL, NO. 50
Second Thursday *
G. S. Clarke, *Chairman*
1135 Joliette
Coteau Rouge Rd.,
Longueuil, Que.

MUNCIE, NO. 70
Second Wednesday *
William J. Brown, *Chairman*
1212 Bundy Court,
New Castle, Ind.

NASHVILLE, NO. 43
Third Friday *
C. L. McCaffrey, *Chairman*
1513 Ashwood Ave.,
Nashville, Tenn.

NEW HAVEN, NO. 41
Second Thursday *
Alton V. Pollard, *Chairman*
American Brass Co.
55 Liberty St.,
Ansonia, Conn.

NEW ORLEANS, NO. 60
Second Wednesday *
Carl Hazlewood, *Chairman*
6574 General Haig,
New Orleans 19, La.

NEW YORK, GREATER, NO. 34
First Monday *
W. H. Lentz, *Chairman*
630 Victory Blvd., Grymes Hill,
Staten Island, N. Y.

NIAGARA DISTRICT, NO. 65
First Thursday *
H. F. Gorth, *Chairman*
62 Thomas St.,
St. Catharines, Ont.

NORTH TEXAS, NO. 51
Second Friday *
John A. Lapham, *Chairman*
2700 Western Ave.,
Fort Worth 7, Texas

NORTHERN NEW JERSEY, NO. 14
Second Tuesday *
Charles B. Carlson, *Chairman*
Ediphone Division
Thomas Edison, Inc.
West Orange, N. J.

PEORIA, NO. 31
First Tuesday *
Gordon Swardenski, *Chairman*
214 Weiman Ave.,
Bartonville 7, Ill.

PHILADELPHIA, NO. 15
Third Thursday *
Samuel R. Boyer, *Chairman*
5865 Hadfield St.,
Philadelphia 43, Pa.

PITTSBURGH, NO. 8
First Friday *
Walter S. Risser, *Chairman*
1332 Franklin Ave.,
Pittsburgh 21, Pa.

PONTIAC, NO. 69
Third Thursday *
Eldon Hall, *Chairman*
5048 Mound Rd.,
Warren, Mich.

PORTLAND (MAINE), NO. 46
Fourth Friday *
Harold D. Andrews, *Chairman*
Twin City Machine Co.
31 Mechanics Row
Auburn, Maine

PORTLAND (OREGON), NO. 63
Last Tuesday *
Everett Werner, *Chairman*
2919 S.E. Clay Ave.,
Portland 15, Ore.

POTOMAC, NO. 48
First Thursday *
Daniel T. Hilleary, *Chairman*
116 N. Highland St.,
Arlington, Va.

RACINE, NO. 2
First Monday *
William Reinhardt, Jr., *Chairman*
837 Blaine Blvd.,
Racine, Wis.

RICHMOND, NO. 66
Second Tuesday *
Ralph McKee, *Chairman*
Webster, Ind.

ROCHESTER, NO. 16
First Monday *
H. O. Simon, *Chairman*
94 Harvington Dr.,
Rochester 12, N. Y.

ROCKFORD, NO. 12
First Thursday *
H. A. Nelson, *Chairman*
Barber Colman Co.
150 Loomis St.,
Rockford, Ill.

ST. LOUIS, NO. 17
First Thursday *
Harrel M. Creasey, *Chairman*
Box 708-6, Route 6,
Sappington 23, Mo.

SAN DIEGO, NO. 44
Second Tuesday *
Raymond W. Peters, *Chairman*
6952 Fitch Court,
San Diego 11, Calif.

SCHENECTADY, NO. 20
Second Thursday *
Ray E. Ellis, *Chairman*
1448 Myron St.,
Schenectady 8, N. Y.

SEATTLE, NO. 39
Second Tuesday *
Clyde A. Peterson, *Chairman*
Rt. 2, Box 210
Bellevue, Wash.

SOUTH BEND, NO. 30
Second Tuesday *
Norman R. Smith, *Chairman*
3941 Cottage Ave.,
Mishawaka, Ind.

SPRINGFIELD (ILLINOIS), NO. 64
First Tuesday *
H. C. Chambers, *Chairman*
1817 Dial Court,
Springfield, Ill.

SPRINGFIELD (MASS.), NO. 32
Second Monday *
George R. Brown, *Chairman*
52 Barber St.,
Springfield, Mass.

SPRINGFIELD (OHIO), NO. 76
Fourth Thursday *
Joseph E. Charters, *Chairman*
The Oliver Corp.
270 Monroe St.,
Springfield 99, Ohio

SYRACUSE, NO. 19
Second Tuesday *
Lester H. Collins, *Chairman*
177 Ridgeway Ave.,
Syracuse, N. Y.

TOLEDO, NO. 9
Second Wednesday *
Lawrence F. Rothert, *Chairman*
6021 Acres Rd.,
Sylvania, Ohio

TORONTO, NO. 26
First Wednesday *
John W. Lengbridge, *Chairman*
41 Kelso Ave.,
Toronto 12, Ont.

TRI CITIES, NO. 23
First Wednesday *
E. B. Benson, *Chairman*
2440 27th St.,
Moline, Ill.

TWIN CITIES, NO. 11
First Wednesday *
Harold D. Sullivan, *Chairman*
4038 28th Ave. S.
Minneapolis 6, Minn.

TWIN STATES, NO. 40
Second Wednesday *
W. C. Hadfield, *Chairman*
33 Pine St., Springfield, Vt.

WESTERN MICHIGAN, NO. 38
Second Monday *
Edmund E. Cedarquist, *Chairman*
523 Fremont Ave. N.W.,
Grand Rapids 4, Mich.

WICHITA, NO. 52
Second Wednesday *
Leigh S. Icke, *Chairman*
657 N. Terrace Dr.,
Wichita 6, Kansas

WILLIAMSPORT, NO. 49
Second Monday *
Delbert M. Lowrey, *Chairman*
1233 Park Ave.,
Williamsport, Pa.

WINDSOR, NO. 55
Second Monday *
Alfred J. Hodgins, *Chairman*
995 Lawrence Rd.,
Windsor, Ont.

WORCESTER, NO. 25
First Tuesday *
Ralph E. Rawling, *Chairman*
22 Elm St., Shrewsbury, Mass

*** CHAPTER MEETING NIGHT**

TOOLS OF TODAY

Precision Balancing Machine

Designed to speed up quality production of rotating parts, the Micro-Poise Model 3580 Balancing Machine quickly and accurately locates and measures unbalance in rotating parts. If the work is such that unbalance can be corrected by drilling out excess material, a vertical or horizontal drilling unit can be attached as an integral part of the machine.

The Model 3580 balancing machine, developed and marketed by Micro-Poise Engineering & Sales Co., 14851 Grand River Ave., Detroit 27, is sturdily built and designed so that there is no strain or shock on critical points during loading or unloading operations. Parts are centered on a locator in a horizontal plane on the balancing assembly. Work rests on the balancing point only while the reading is being made. Operation of a control lever frees the balancing assembly to tilt in any direction. If the part is not in balance it will tilt toward the heavy point. A universal spirit level with radial and concentric graduations indicates the location and amount of unbalance.

The concentric graduations are on interchangeable transparent plastic dials calibrated for the specific parts. Unbalance may be read in inch-ounces within six seconds after release of the operating lever. **T-11-1**

Universal Broach Sharpener

Announced by Colonial Broach Company, Box 37, Harper Sta., Detroit 13, a line of broach sharpeners, comprising two universal and five other basic models, is designed to meet a wide range of requirements established by the present greatly expanded use of broaching in its many diversified forms.

The Colonial line includes two flat broach sharpeners that will take at one setting broaches up to 8 in. wide and up to 32 in. and 65 in. long, respectively; three round broach sharpeners—for spline, serration, and other types—that will take broaches up to 6 in. in diameter and up to 36 in., 72 in., and 84 in. long, respectively; a "universal" model illustrated that will handle round broaches up to 6 in. in diameter and up to 72 in. long, and flat broaches up to 8 in. wide and 65 in. long; and another "universal" model that will handle round broaches up to 6 in. in diameter and up to 84 in. long, and flat broaches up to 8 in. wide and 77 in. long.

All grinding wheels and headstocks are equipped with built-in motors. The grinding wheel spindles have a standard speed of 4,000 rpm which can be increased to a maximum of 10,000 rpm through use of special pulleys. Headstocks on the machines for sharpening round broaches—as well as on the "universal" models—have 2-speed gearing for spindle speeds of 200 and 400 rpm.

On each of the machines, all controls—start and stop buttons, table movement controls, and controls for raising and lowering the grinding head on the flat broach sharpeners—are conveniently located within easy reach of the operator working from one position in front of the machine. **T-11-2**

Grinding Wheel Dresser

The Tru-Dress grinding wheel dresser has been announced by Crown Industrial Products Co., 1510 E. 53rd St., Chicago 15. This dresser is available in two sizes—with 3-in. diameter emery wheel for normal service and with 4-in. wheel for larger grinding wheels and heavy-duty service.

The smaller unit has the 3-in. wheel mounted on hardened steel bearings protected from dirt and abrasive. In the larger Tru-Dress, the wheel is mounted on precision, sealed ball bearings which assure good balance. Part of the handle of this larger dresser may be removed, leaving a straight shank for clamping in the tool holder of a cylindrical grinder when desired. **T-11-3**

See Page 72 for Handy Tools of Today Coupon

Fork Lift Truck

A gasoline-powered fork lift truck, featuring unusual simplicity of design, is in production at Transitier Truck Company, Portland, Ore. Available in 1/2 ton and 1-ton capacities and with 5, 7, and 9-ft. lift heights, the Transitier offers a hydraulic clutch which can be adjusted or completely changed in 15 minutes, it is claimed by the builders.

Among the design details are full pneumatic tires for greater comfort and speed on bumpy road surfaces; all-welded one piece body frame; 4-cylinder "Cobra" engine that develops 26 hp.; and 61-in. turning radius for high maneuverability in close quarters.

T-11-4

Stub Core Drill Holder

Designed primarily for relatively shallow hole operations in turret lathes, but applicable to similar operations in drilling machines, a short series holder for use with standard core drill cutters has been introduced by the Eclipse Counterbore Co., Detroit, Mich.

The smallest of the four drill cutter holders available is 1-1/4 in. in diameter, taking Eclipse standard core drill cutters from 1-1/2 to 1-13/16 in. diameter. The next size is 1-1/2 in., and accommodates cutters from 1-7/8 to 2-3/16 in. The third size is 1-3/4 in. in diameter, taking cutters from 2-1/4 in. to 2-9/16 in. The fourth and final holder drives cutters from 2-5/8 in. to 3 in. inclusive, while being 2 in. in diameter.

The body of the new stub core drill-holder is non-fluted and is approximately one-half the length of the conventional fluted types. Standard Morse taper shanks are used. The plain or stub holder affords a greater rigidity and is more economical due to the elimination of milling the long flutes and grinding O.D. and flute faces. **T-11-5**

For more information on products reviewed in this section, turn to page 72, for handy, keyed return form.

Special Drilling Machine

Processing parts four at a time, cast in a single piece, a special machine built by the Cross Company, Detroit 7, facilitates both manufacturing and handling. A total of 150 castings, or 600 individual valve rocker shaft brackets, are drilled and reamed hourly by a single operator. Ten holes are finished in each casting.

A power-operated index table provides for cutting two clusters of four parts each in every one of six working stations, while loading and unloading are accomplished at an independent station. Thus, 12 sets, or 48 parts, are progressively machined at one time. Feed is hydraulically controlled.

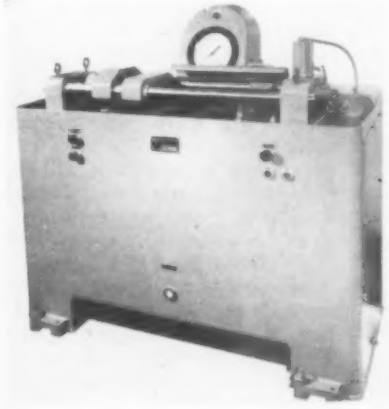
T-11-6

Tube-Pressure Tester

Designed for the pressure testing of tubing of various lengths, a hydrostatic testing machine introduced by Steel City Testing Machines, Inc., 8843 Livernois Ave., Detroit 4, handles 20,000 psi in the standard model. The same type machine can be built to order for higher pressures where required.

The machine seals the end of the tubing without forming any perceptible flare, eliminates the air, and builds up to the required pressure. For a predetermined time cycle, it holds the pressure and then automatically reverses and is ready for the next test. Pressure can be read either by a gauge or by a red light on the panel which lights up at the peak test pressure. Complete time cycle from load to unload requires approximately 4 seconds.

T-11-7



Improved Buffer-Polisher

To line of infinitely variable speed buffer olishers, the Standard Electrical T Co., 2499 River Rd., Cincinnati , has added a jack-shaft construct which permits an infinite low-speed nge, or a 2-in-1 arrangement for h low-speed and high-speed range

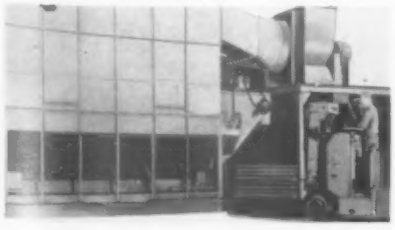
The conventional infinitely variable speed buffer-polisher has a speed range from 1500 to 3000 rpm, with "Speedial" control. With the Type 3VJ2 illustrated, the infinite speed range available is from 600 to 3600 rpm. This machine is equipped with a 3-hp. motor, enclosed spindle, and four ball bearings. Smaller 1 and 2-hp. sizes are available, with two ball bearings and open spindle construction optional.

The similar Type 3VJ is furnished only for an infinite slow speed range, which can be any 2-to-1 ratio—600 to 1200 rpm, or 700 to 1400 rpm, for example. This slow speed range is desirable in many plastic manufacturing processes, laboratory work, and elsewhere. **T-11-8**

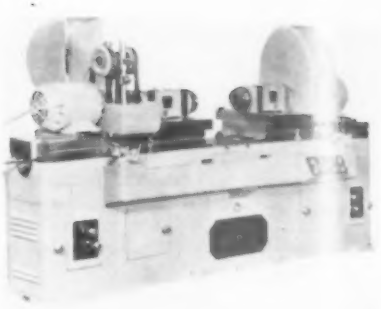
Stainless Dust Arrester

A 30,000 cfm Centri-Merge Swirl Type Arrester, made of stainless steel, has been announced by Schmieg Industries, Inc., 329 Piquette Ave., Detroit 2. The unit is designed to remove dust and dirt from shakeout stations, sand handling, and conditioning systems. Sludge disposal is by skid on a lift truck.

With conveyor drive mounted on top of the conveyor spout, this compact unit occupies a minimum of floor space. The all stainless steel construction assures minimum maintenance costs through a long corrosion-free life. **T-11-9**



Precision Boring Machine

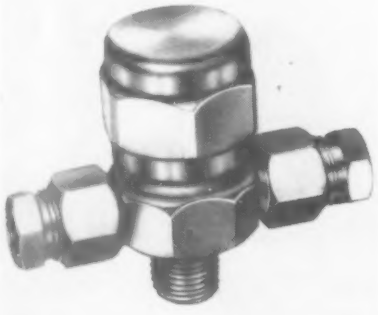


Built by the Simplex Machine Tool Division of Stokerunit Corporation, Milwaukee, Wisconsin, an improved precision boring machine—Model 2UA—features many design refinements that assure greater accuracy and lower maintenance. The adaptability has been increased by the design of bridges that permit greater use of multiple head installations and head mounting modifications.

A sealed-in lubrication system in the heads eliminates foreign matter and offers exceptionally cool operation. Coolant troughs are adequate even when the operation requires flooding of the workpiece with coolant. The massive one-piece bed design provides the rigidity required for heavy roughing cuts and for precision boring. Easily-serviced unit type hydraulic systems isolate vibration and heat from the machine proper. T-11-10

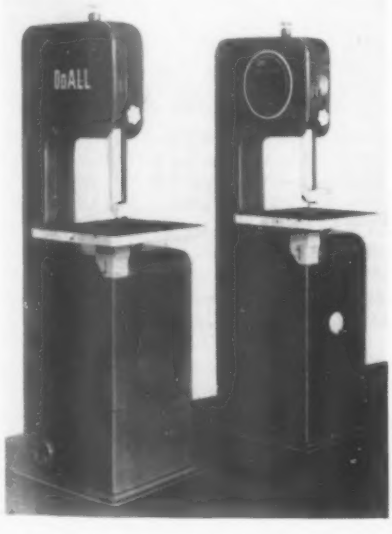
entral Lubrication

An ...ncement of the Grannan Lubricator ... valve that delivers a positive mete... amount of oil or grease to a bear... has been made by Titeflex, Inc., ... Frelinghuysen Ave., Newark 5, N. J. With a lubricator installed directly into each bearing in a machine or apparatus, or a battery of machines using the same lubricant, lubricant introduced at any one point in the system will deliver to each bearing the exact predetermined amount.



The system will function equally well when fed with hand operated guns or from a completely automatic unit set to operate at any desired interval. Lubricators will operate efficiently between temperatures of zero and 300 deg. F. Operation of the machine or other equipment does not interfere with the action of the lubricators, a feature which eliminates any down-time for lubrication. Central lubrication, where the precise required amount of lubricant enters each bearing, tends to increase machine efficiency, cuts bearing failures, and insures safety of maintenance men. **T-11-11**

Utility Band Saws

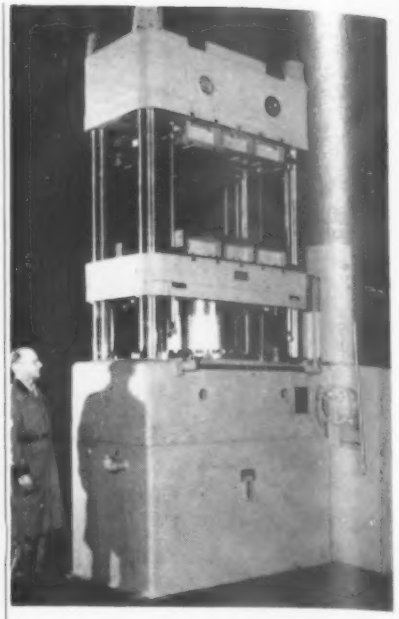


A popular-priced line of full size band saw machines has been introduced by The DoALL Company, Des Plaines, Ill. The "Utility" model is a 16-in. convertible machine that resembles the standard heavy duty DoALL machines in appearance but which permits small manufacturers to order exactly how much saw they want and adapt it to a wider range of usefulness as business warrants.

The Utility saw offers many features found in the higher-priced machines. The shell is pressed steel, completely enclosing all working parts. The rigid frame is arc welded over die forms and integral with the shell structure. A dust chute is built in and empties from the front. Throat depth is 16 in., work thickness capacity 12-1/8 in., and table size 20 in. x 20 in. with 45 deg. tilt right and 5 deg. tilt left.

A wide range of optional accessories permit adaptation of the machine to many different applications.

The basic machine in the Utility series is the Model HS, with one high set-speed or four-speed step pulley drive, and suitable for non-metallic cutting. The Model HSV has a variable high speed range of 850 to 8200 fpm for fast accurate cutting of aluminum, sheet steel, and light structural shapes. Model LHV offers high and low variable speeds (50 to 300 fpm and 850 to 5200 fpm) for cutting all ferrous and non-ferrous materials and alloys. Model SFP has the same speed range, but includes equipment for filing and polishing operations as well as welding of saw bands. **T-11-12**



Compression Molding Press

Especially noted for holding large thermo-setting plastic parts, a compression molding press recently built by the Hydraulic Press Mfg. Company of Mt. Gilead, Ohio, has a pressure capacity of 500 tons. The semi-automatic press has a maximum mold size of 42 in. x 36 in., with a 54-in. clearance between platen and head and maximum ram travel of 26 in.

A large upward acting hydraulic ram is fitted with a small internal booster ram, providing high speed closing up to 320 inches per minute. Automatic slow-down is provided prior to mold contact.

For optional use by the operator, the press is equipped with automatic breathing or degassing system. It is also equipped with upper and lower mechanical ejectors and an H-P-M Hydro-Power variable delivery radial, piston type hydraulic pump with 25-hp. motor direct drive through flexible coupling. **T-11-13**

Solid Carbide End Mills

Solid carbide single and double end mills are available from Raymac Manufacturing Company, Inc., 3729-21 Cass, Detroit 1. It is claimed that these mills can be operated at twice the normal speeds of high-speed steel. In addition, they offer longer life, and true cutting due to the stiffness of the solid carbide shank.

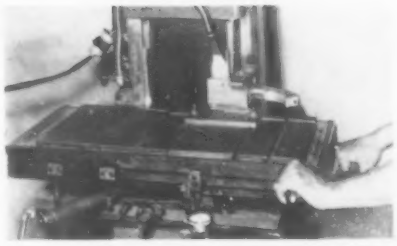
Raymac end mills are machine ground for uniformity and concentricity, with a tolerance of plus .000 to minus .001 in. They are made in straight shanks only. Cutter diameter sizes range from 1/16 to 9/16 in., with a cutter head tolerance from plus .001 to minus .001 in. **T-11-14**

B[e] Grinder Feed Table

A[n] improved automatic feed table, Mod[el] FT-9, for use in the Model BG-8 w[ide] abrasive belt grinder, is offered by F[inis]her-Cable Machine Co., Syracuse, N. Y. The table automatically controls the pressure and rate of feed while a dial indicator shows rate of machining. A micrometer stop halts the operation, and can be quickly reset.

Oil systems for coolant and for table feed are separate. This enables the selection of the best coolant for any given material, while retaining a standard hydraulic oil for table operation. Changes in the piston design have contributed to smooth, positive action.

Use of the Model FT-9 table permits



grinding and polishing many materials to close tolerance—plastics, glass, ceramics, wood, and others. Chamfers, radii, corners, flat and parallel surfaces can be obtained with greater precision and smoother approach of work to belt.

T-11-15

Stretch Former by Hufford

The Model 50 Stretch Former, designed and built by Hufford Machine Works of Redondo Beach, Calif., employs the same basic mechanical principles that have been thoroughly time-tested in previous models. A stationary Kirksite die having the desired contours of the finished part is bolted to the table top, material is gripped at each end between two separate jaws and positioned in contact with the front die face. Hydraulic cylinders then stretch the material and simultaneously wrap it around the die by means of hinged arms on which tension cylinders are mounted.

Model 50, designed to stretch form sheet stock up to 42 in. wide x 12 ft. long, introduces several design features. Jaws of 42-in. width are composed of 7 separate pairs of 6-in. inserts. Each pair is individually operated by pneumatic cylinders. In the case of smaller stock widths, only the inserts in contact with the work need be operated, eliminating the need for shimming unused portions.

Jaw housings can be rotated 20 deg. each side of vertical in both longitudinal and transverse planes; stock material can thus be made to conform to most non-symmetrical die contours. Also, these features equalize forming stresses across sheet width and reduces

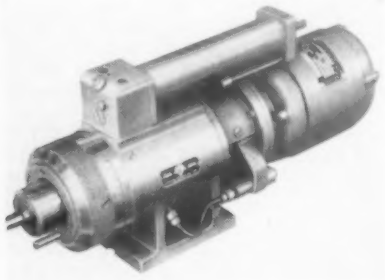
concentrated stressing at one point.

In order to rapidly accommodate various stock lengths, yoke movement is motorized, easily increasing or decreasing spacing between jaws. Arms are independently operated, which increases the machine's versatility.

Model 50 Stretch Former exerts a maximum tension cylinder pull of 106,000 lbs. Maximum operating pressure is 1000 psi on all cylinders. Speed of arm traverse over 90 deg. is 30 seconds. Travel can be halted at any portion of this arc by means of limit switch cams. Maximum stock thickness handled is determined only by yield point of material. T-11-16

Versatile Power Unit

An air-hydraulically operated power unit that makes possible production drilling in any position, angle, or plane has been developed by Cleveland Republic Tool Corp., 1265 Union Commerce Bldg., Cleveland 14. The smaller Model 250 will drill 1/4 in. in steel, while Model 500 will drill up to 1/2 in. in steel. Both models are applicable to milling, riveting, chamfering, slot sawing, and spot facing operations.



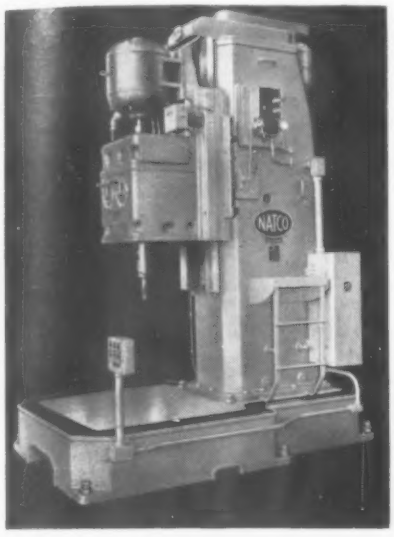
Ideal for multi-mounting in series for simultaneous operations, these power units boast a rapid approach feature and variable feed which allows the tool to come within .001 in. of the work, at which point the "work feed" automatically cuts in smoothly. A micrometer adjustment and lock screw can control depth of drilling, counterboring, and chamfering to tolerances of less than .001 in. Maximum spindle stroke is 1-1/4 in.

Motor and operating mechanism are totally enclosed. The four moving parts in each drill unit work in a bath of oil. Units can be provided with hand, foot, semi-automatic, or fully automatic controls. T-11-17

Drill Testing Machine

A heavy duty hydraulic drill-testing machine, designed and built by The National Automatic Tool Co., Richmond, Ind., operates at peak efficiency under abnormal or overloaded conditions in testing the life of tools made by a prominent drill manufacturer.

To operate under unusual stresses and loads at various speeds, the machine was equipped with a heavy-duty single spindle, 7-speed geared head. A range of 42 different speeds is permitted through change gears. The 30-hp. motor maintains a synchronous speed



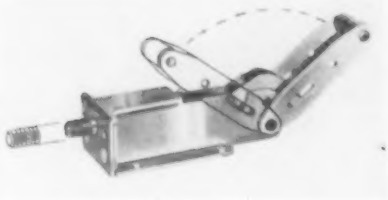
up to the rated hp. when drills become dull. As the load builds up to a predetermined value, a torque limiting device stops the motor. A shear pin arrangement offers additional protection against the destruction of gears in the head under extreme loads.

An extra-rugged frame construction was developed to provide maximum rigidity to the column, head, and spindle. **T-11-18**

Push & Pull Clamp

Intended for many applications where the conventional toggle clamps are not fully satisfactory, a push & pull clamp, Model P&B-800, is offered by Lapeer Mfg. Co., Lapeer, Mich. It is especially applicable in close quarters or where the operating handle cannot be accommodated except at some distance from the point of pressure application.

The clamp can exert up to 800 lbs. pressure with normal hand operation in either the push or the pull movement of the handle, which automatically locks and holds work securely upon completion of the handle swing. It can be used with the plunger creating



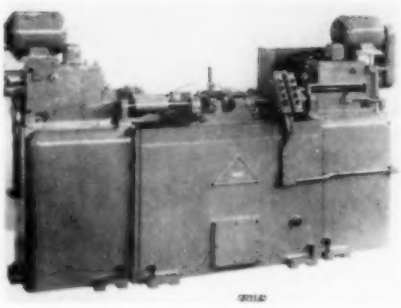
pressure at the end of the stroke, or it can be used to exert a continuous pushing or pulling motion during the entire 1-1/4-in. travel of the plunger.

The clamp can be mounted on the bottom or the front, at any angle that will allow free swing of the handle. **T-11-19**

Standard Drilling Unit

Intended for use with small tools that do not require a heavy thrust and permit use of a single-ram hydraulic feed, the No. 1000 drilling unit—smallest of a line manufactured by LeMaire Tool & Manufacturing Co., 2657 So. Telegraph Rd., Dearborn, Mich.—may be mounted horizontally, vertically, or at any angle in special purpose machines, such as the one illustrated.

The No. 1000 unit is driven by a 1½-hp. or 2-hp. motor. The feed rate is 135 in. per minute for rapid approach and return, and slow feed can be varied from ½ in. to 35 in. per minute by merely turning a dial. Movable cams, mounted on a cam bar, control the



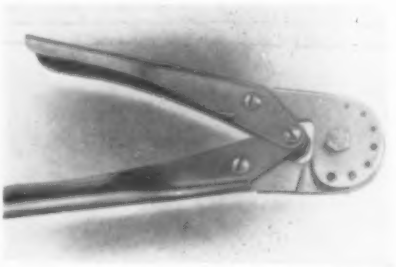
length of feed up to a maximum stroke of 4-1/2 in.

The same motor that drives the spindles also powers the hydraulic pump. Pump speed is kept constant with spindle speeds being varied from 365 to 4810 rpm, using various pairs of easily replaced speed change gears. Unit may be used for single-spindle drilling or in mounting a multiple-spindle head.

The special-purpose machine shown, incorporating two No. 1000 standard hydraulic drilling units, was designed and built by LeMaire to drill 300 steering idler arms per hour. Each No. 1000 unit drives and feeds a 2-spindle head. T-11-20

Rivet Cutter

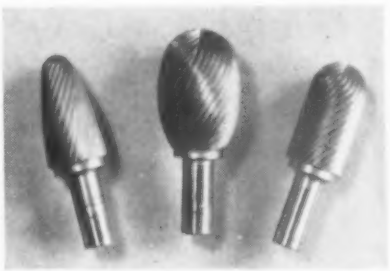
A handy tool that cuts rivets of any standard diameter from 3/32 in. to 3/16 in. inclusive is being distributed by Air Associates, Inc., Teterboro, N. J.



Having been designed for use by women aircraft workers, the 12-oz. cutter can be handled with extreme ease by anyone. It makes a sharp, clean cut which leaves no burr to interfere with the immediate use of the rivet in the hole intended for it. T-11-21

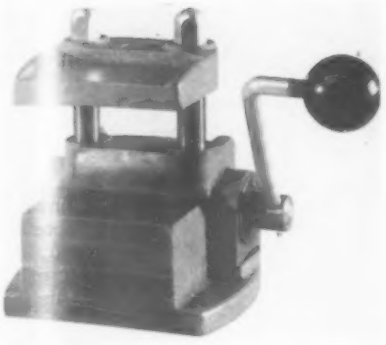
Large Carbide Midget Mills

A large size solid carbide mill in each of three popular shapes has been added to the line of carbide midget mills offered by Severance Tool Industries, Inc., 728 Iowa St., Saginaw, Mich. The additions will permit the advantages of carbide midget mills to be applied to larger and heavier work than heretofore.



Operating preferably at speeds of 2,000 to 5,000 sfpm, the cutting action and controllability of carbide midget mills in light power tools provide exceptional finishes, in many instances replacing grinding and eliminating the dust protective equipment necessitated by many fine grinding operations.

It is claimed that carbide mills outlast their high speed steel counterparts from 30 to 50 times on abrasive and tough materials, in addition to cutting hard materials up to 63-C Rockwell. T-11-22



Rack and Pinion Jigs

Two midget size rack and pinion jigs have been added to the line offered by Siewek Tool Company, 2862 East Grand Blvd., Detroit 2. The Model 4920 has a working area of 1-1/2 in. x 2 in. with a closed opening of 1 in. and a lift of 1 in. Model 4960 has a working area of 1-1/2 in. x 3 in. with a closed opening of 1 in. and a lift of 1 in.

These midget jigs have been especially designed for small parts that ordinarily require costly holding devices. Many small-parts manufacturers can now initiate a real economy in their drilling operations. Jig bases and top plates are precision bored which assures greater accuracy and assures interchangeability of top plates. **T-11-23**

Carbide Mining Tools

Developed by Firth Sterling Steel & Carbide Corp., McKeesport, Pa., a line of drill and cutter bits tipped with Firthite sintered tungsten carbide is designed for high production coal mining. Firthite-tipped mining tools are outlasting steel bits by 10 to 100 times.

The cutting machine bits are fabricated for ordinary cutting or heavy duty. The Firthite tips are brazed onto a shank of drop forged, heat treated steel. Auger drill bits are of the two-prong type designed especially for high speed drilling. One style of this bit was developed for use where a core forms in drilling, such as in anthracite coal, clay, and certain rock formations. Finger bits with Firthite tips are available for use in strip mining. **T-11-24**

Dry Grinding Belt

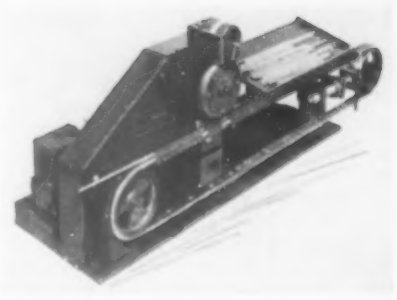
A heat-resistant dry grinding belt, by Behr-Manning Corp., Troy, N. Y., is claimed to give production increases of 4 to 1 over the regular glue-bond adhesive type belt in high heat-generating operations.

The Resinall Metalite Cloth belts utilize special heat-resistant, thermo-setting resin adhesives instead of the conventional glue-type adhesives. Abrasives in this type of bond remain sharper over a longer period of time. It is claimed that substantial increases both in number of pieces per man-hour and in number of pieces per belt have been repeatedly demonstrated on heat-generating operations. **T-11-25**

Motorized Rod-Tube Marker

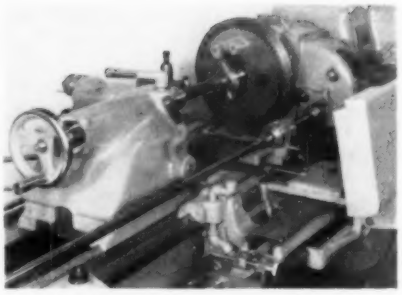
A Universal Marking Machine, No. C-1055-A, for the automatic printing of welding rods, solder bars, short-length tubing, and other products, is being manufactured by The Pannier Corp., 223 Pannier Bldg., Pittsburgh 12, Pa. This unit, powered by a 1/4-hp. motor, prints on any rod or tubular material of 1/8 to 2-in. diameter in uniform or irregular lengths from 2 to 24 in. Operating at 72 ft. per minute, it prints in perfect register and compensates for bar recesses.

The machine is equipped with a quick-change printing wheel; hopper feed; belt conveyor; automatic, interior-feed ink fountain; and adjustments for wear. Printing wheel and conveyor are synchronized for continuous or intermittent printing. A choice of dovetail rubber wire dies, quickset rubber dies, or interchangeable rubber type is offered. **T-11-26**



Lathe Relieving Attachment

As an accessory for Sidney lathes, new or in current use, a universal relieving attachment, which incorporates a 4-to-1 spindle speed reducer integral with the change gear box, has been developed by The Sidney Machine Tool Co., Sidney, O. This attachment eliminates the need for 2-speed motors or other devices commonly used to obtain reduced spindle speeds. It permits plain, external, form, end, internal, angular, and spiral relieving.



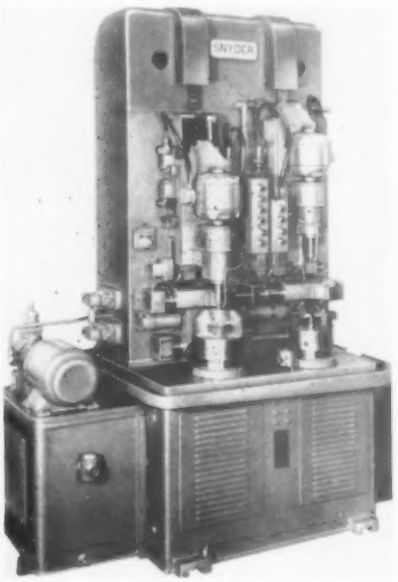
The complete driving mechanism is mounted on the back side of the lathe to allow free access to all lathe controls. Change gears are easily accessible beneath a cover which is held by wing nuts and pivots out of the way. A quick-reference index plate on the housing shows the gearing required for various operations.

A time on the drive shaft enclosing the gear change housing enables the operator to pick up any relief at any point with a minimum of effort, while a clutch lever is provided to disengage the relieving attachment drive for conventional turning.

Universal joints are eliminated entirely by a right angle drive from the change gear housing to the compound. Tool travel is quickly adjusted by loosening one stud and sliding arm to required location in shoe. This makes unnecessary the replacement of cams with various throws. T-11-27

Special Purpose Machine

Designed and built by Snyder Tool & Engineering Co., Detroit, a special machine—equipped with standard units—center drills and faces the head end of 444 automotive pistons an hour, operating at 85% efficiency.



Occupying a floor space of 50 in. x 44 in., the machine is equipped with two Snyder standard, hydraulic slide units carrying single spindle heads used for the center drilling operation. Mounted on the face of the machine column are two cross slides carrying the facing tool blocks. Each has an independent hydraulic feed system which permits the operator to load and unload a piston in one side of the machine while a second piston is being machined on the opposite side.

On either side, work is loaded in a four-jaw chuck mounted in the machine base directly beneath the centering spindle. Jaws are hydraulically actuated. Chucks, which rotate during the facing operation, are equipped with a height locater which contacts the inside of the piston head and establishes a controlled thickness during the facing.

Rpm of either spindles or chucks may be easily altered by change of "V" belts and sheaves. Feed rates of center drill and facing slides are adjustable.

T-11-28

Self-Align Die Lifters

Speed and safety in handling dies, machinery, and other heavy objects equipped with suitable threaded holes, are assured by the used of self-aligning die lifters available from Modera Collet & Machine Co., 401 Salliotte St., Ecorse 18, Mich. Die lifters are quickly installed and removed, and four sizes handle all ordinary requirements.

Units consist of a swiveling eye, which accommodates standard lifting hooks, and a stud assembly, which turns as a unit for attaching and removing the die lifter. The stud is quickly clamped at proper depth by turning the round nut inside the eye until the collar at the bottom seats against the object to be lifted. Since the eye swivels freely at all times, the stud cannot work loose.

Die lifters are available in four sizes, with maximum lifting capacities of 16, 28, 40 and 100 tons each. Studs are of 3/4, 1, 1-1/4, and 1-1/2 in. diameter, respectively, and have U. S. Standard threads. All parts are made of heat-treated alloy steel of every 180,000 psi tensile strength. **T-11-29**

Soluble Oil Mixer

Available from the Alemite Division of Stewart-Warner Corp., 1826 Diversey Pkwy., Chicago 14, a soluble oil mixer performs three operations simultaneously, for application in plants where soluble oils are used for lubrication. The mixer proportions water and soluble oil, mixes them into a uniform emulsion, and transfers the soluble oil from the original drum into another container ready to pour into the machine sump or circulating system.

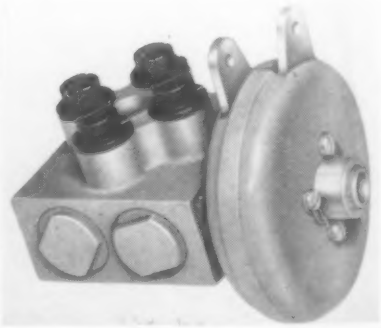
The mixing unit is inserted in the bunghole of a drum of soluble oil, connected by hose to a water outlet, and adjusted. Water pressure averaging 24 to 30 psi is the only power required. Model 6780 is supplied with a 2-in. pipe-thread sliding bung adapter for various heights of drums. The compact unit weighs 5½ lbs. **T-11-30**

Punch Press Guard

A punch press guard that requires both hands for release of the punch but at the same time minimizes hand travel, has been announced by Graham Specialty Company, 12925 Auburn, Detroit 23. Particularly designed for any size of inclinable, direct clutch press that does not necessitate more than 150 lbs. pull to operate the standard foot trip, Guard Model A-E#100 may be easily installed by plant employees.

An air thruster, which replaces the orthodox foot treadle, releases the clutch allowing the ram to make one complete revolution the same as when tripped by the foot treadle. The air thruster operates, however, only when both of two push buttons are pressed. These are located just above the work area and far enough apart to require one hand on each button. This takes both hands out of the danger zone but to where they can be instantly dropped for speedy reloading. An anti-repeat switch allows the ram to descend only once, unless both push buttons are again pressed. T-11-31

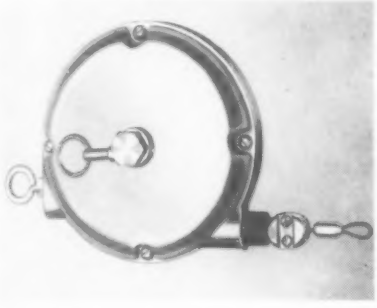
Hydraulic Selector Valve



A follow-up selector valve, developed by Electrol, Inc., Kingston, N. Y., is designed for manual or automatic operation. The valve can be adapted to mechanical hydraulic systems for such applications as multiple brake actuation, furnace control, machine tool controls, and maintaining equal tension. It is light in weight, easy to install, and available in sizes required for specific purposes. T-11-32

Self-Winding Balance Reel

Speeded production and reduced operator fatigue are claimed for the Zoe "Self-Winding" Balance Reel announced by Aero-Motive Manufacturing Co., Kalamazoo, Mich. Such portable tools as power screw drivers, nut runners, and drills are suspended within constant ready reach of the worker for instant use, and are raised out of the way when released.



The power tool is fastened to the end of a 6-ft. cable wound on a drum within the housing. Reel tension is easily regulated to balance any tool weighing up to 10 lbs. Tension nut and lock are located on the same side of the reel housing for quick adjustment. The reel is mounted on oilless bearings within a heavy duty cast aluminum alloy housing that is dirt and dustproof. The slide location of the cable outlet minimizes wear and strain on the cable.

T-11-33

Production Contour Miller

Designed for the continuous production of aluminum and other non-ferrous metals with similar cutting characteristics, the Model A-18 contour milling machine—developed by Onsrud Machine Works, Inc., 3900 Palmer St., Chicago 47—features dual rotary tables. While work is being milled on one table, the other is being loaded. Thus, there is no time lost between machining cycles and operator motion is cut to a minimum.

As each operation is completed, the operator presses a foot pedal which automatically disengages the driving clutch for the rotating table, engages the clutch for the waiting table, and shifts the cutting tool to the new work. The automatic features and the machine's fidelity to close tolerances permit its efficient use by non-skilled labor.

Cutter head assembly consists of a high speed belt-driven spindle, cutter, and guide roller mounted on the front end of an overarm that pivots to right or left hand table as required. Held in place on the tables by means of air clamps operating under 700 psi and synchronized with the travel of the overarm, the work is rotated past the cutter. The air-held roller contacts and follows the pattern under the work, guiding the cutter. The rollers may be adjusted to compensate for cutter wear.

The cutter spindle operates at 11,500 rpm, permitting excellent work finish. Table rotation speeds are variable and may be adjusted while the machine is in operation. Many other mechanical refinements and safety features recommend the consideration of this tool.

T-11-34

Castable Refractories

Two castable refractories for service temperatures up to 3000 deg. F. have been announced by Johns-Manville, 22 E. 40th St., New York 16. 3X Firecrete and 3X Blazecrete, both fast air-hardening refractories, offer substantial savings in furnace construction costs because of their adaptability for economical methods of application.

3X Firecrete is recommended by the manufacturers for casting or pouring special refractory shapes — burner blocks, door linings, furnace covers, and complete linings. It is claimed to be as easy to handle as concrete.

3X Blazecrete, while classified as a castable refractory since it is hydraulic setting, was especially developed for pneumatic application, being "shot" in place by compressed air guns. Gunning can be used advantageously both in new construction and in repair work. Where gunning is not practicable, 3X Blazecrete can be readily trowelled in place. **T-11-36**

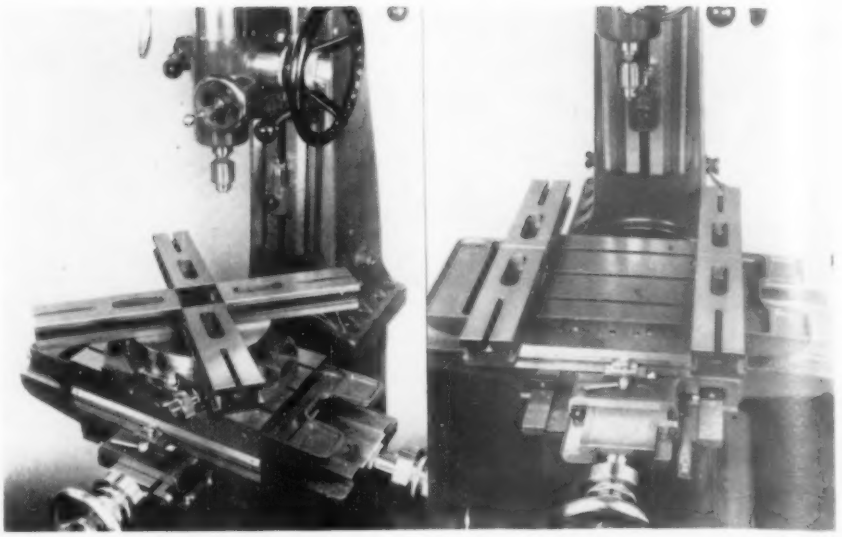
Small Hydraulic Hone Unit

A small size, single-spindle hydraulic honing machine, Model 412, has been developed by the C. Allen Fulmer Company, First National Bank Bldg., Cincinnati 2, O. Suitable to both general purpose work and production runs on small parts, Model 412 is designed for rapid, accurate honing of any type of internal cylinder ranging from 1/2 to 4 in. in diameter.

Model 412 has a maximum honing stroke of 12 in. A hydraulic cylinder allows any reciprocating speed from zero to 80 fpm, which is held constant throughout the entire stroke. Reversals at each end of the stroke are smooth and shockless, and the reciprocating unit is hydraulically counterbalanced.

A 3-hp. motor offers three spindle speeds. Alloy steel reduction gears mounted in oversize bearings run in a constant bath of oil. Power is transmitted to the heat-treated alloy steel spindle through an aluminum bronze splined driver. The splined spindle is 1-1/4 in. in diameter and has a No. 3 Morse taper in the nose to fit conventional production type honing tools.

Accommodating workpieces up to 21 in. in outside diameter, the Model 412 honing machine can be supplied with or without the "stop and dwell" mechanism for honing blind holes. **T-11-37**



Moore Extension Parallels

Extension parallels, for use with Moore Jig Borers and Jig Grinders to increase the effective table size, have been announced by the Moore Special Tool Company, of Bridgeport, Conn.

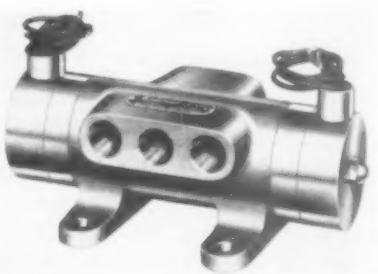
With the extension parallels, the Moore Jig Grinder and Models 1 and 2 Moore Jig Borer can easily accommodate work 5 in. larger than table size in both directions, or work 10 in. larger in only one direction. Table size of the Moore Jig Grinder and the Model 1 Jig Borer is 10 in. x 16 in., that of the Model 2 Jig Borer is 10 in. x 19 in. The 10-in. rotary table for circular parts—used with all three machine tools—can likewise be effectively increased to accommodate rings more than 20 in. in diameter.

Furnished in sets of four, the extension parallels—made from close-grained Meehanite—considerably widen the range of application of Moore machine tools, which use precision lead screws to locate holes by the coordinate method. Ample drill clearance is retained and T-slots are provided for clamping dies in place. **T-11-38**

4-Way Control Air Valve

A compact, solenoid operated, 4-way control valve—available in two sizes—has been added to their CV Control Valve series by Modernair Corporation, 4222 Hollis St., Oakland 8, Cal. Designed for operation on maximum line pressures of 150 psi, the valve is available in two sizes—3/8-in. port and over-all valve dimensions of 7-1/4 in., and 3/4-in. port and over-all dimensions of 10-3/8 in.

Standard coils furnished are for 110/220-volt current operation with current consumption on 110 volts of 1 ampere. Valve is also available with 440-volt coils as standard, or 440-volt coils may be secured and substituted by removing the end cover without affecting air connections.



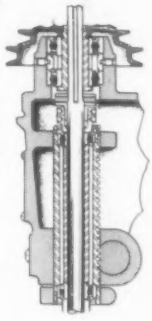
The solenoid coils actuate small secondary valves which in turn control air internally ported from the incoming pressure port. The valve piston is thus forced to its extreme position at each injection of positive pressure behind the piston.

The body of the valve is a heat-treated, sand cast, aluminum alloy casting; valve piston is solid machined brass sealed with aircraft type "O" ring packings which are readily replaceable without disturbing line connections. With wear borne entirely by these packing rings, maintenance costs are kept to a minimum.

Full line volume and pressure is permitted through the valve, and operation is not affected by normal line pressure variation. Accurate control of cylinder piston movement is assured by regulation of either exhaust port. **T-11-39**

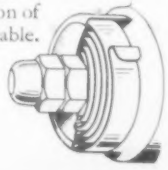
FOUR PRECISION BALL BEARINGS

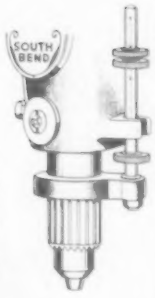
Two on spindle, two on drive sleeve. Pre-lubricated and sealed precision type, no oiling required.



ADJUSTABLE QUILL RETURN SPRING

Retracts quill instantly upon release of feed lever. Tension of spring adjustable.



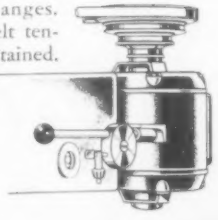


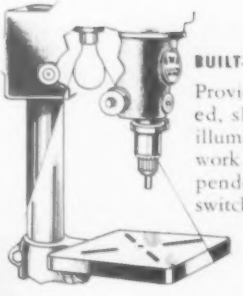
DEPTH GAUGE

Controls feed depth, length of return stroke, or locks spindle in any position. 16th graduations.

BELT TENSION RELEASE

Flip of lever removes tension from belt for easy speed changes. Proper belt tension maintained.





BUILT-IN LIGHT

Provides shielded, shadowless illumination on work area. Independent on-off switch is built-in.

NEW! SOUTH BEND 14" Drill Press

INTERCHANGEABLE SPINDLES

Spindles available to take No. 2 Morse taper shank tools, and for 1/2" straight shank tools, router bits, shaper cutters, etc.

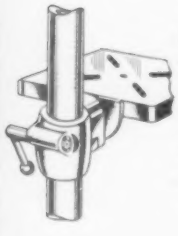
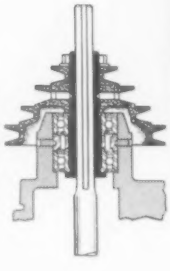


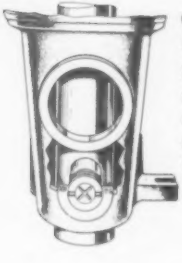
TABLE LOCK

Double-plug binder securely locks table to column. Eliminates misalignment. Column bearing is NOT split

FREE-FLOATING SPINDLE

Design prevents misalignment, side thrust and whip. Precision splines in spindle and sleeve.





QUILL BEARING ADJUSTMENT

Shoe-type take-up provides feather-touch tension and secure locking. Quill bearing is NOT split.

CAPACITIES — SPECIFICATIONS

CAPACITY
Maximum drill size in iron or steel—½". Drills to center of 14¼" circle.

CHUCK
Capacity—0 to ½"

SPINDLE
Regular drill chuck type supplied.
Travel . . . . . 4"

CHUCK TO BASE DISTANCE
Bench Model—17"
Floor Model—46½"

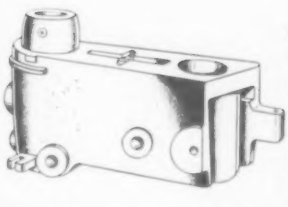
SPINDLE SPEEDS
Four—655 to 4530 r.p.m.

TABLE SIZE
10" x 10". Tilts to any angle.

Bench Model $129.30

Floor Model $144.30

Prices, f.o.b. factory, include drill chuck and 1/3 h.p., 115 or 230 v., 1 ph., 60 cycle motor and switch.

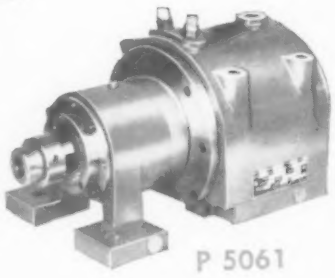


ONE-PIECE HEAD CASTING

Insures perfect alignment. Double-plug binder locks the head to column. Column bearing is NOT split.

SOUTH BEND LATHE WORKS

BUILDING BETTER TOOLS SINCE 1906 • 531 EAST MADISON ST., SOUTH BEND 22, INDIANA



P 5061

P 1744

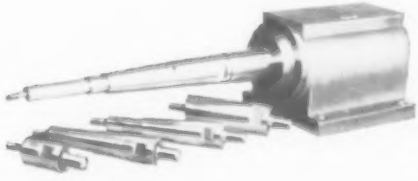
P 2412

POPE

DESIGNS AND BUILDS SPECIAL SPINDLES

Engineered to meet your particular spindle requirements–equipped with Pope *Sealed Lubrication* or *Oil Mist Lubrication,* according to the requirements—constructed by master craftsmen to meet the standards of precision, performance and lasting dependability that distinguish *all* POPE Spindles. Write for recommendations and estimates.

P 5781-2



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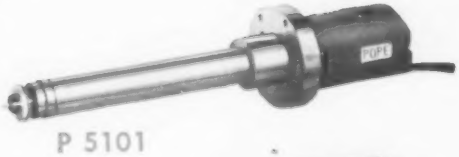

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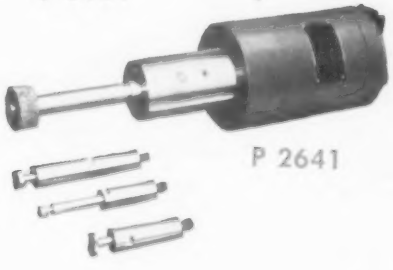


P 2641

No. 54

POPE

TRADE MARK REG. U.S. PAT. OFF.

POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES

Use This Coupon for Complete Information On Tools of Today Items Featured This Month

For your convenience, a key number follows the announcement of each product reviewed in the *Tools of Today* section of THE TOOL ENGINEER. To obtain complete information on any of these products, circle the corresponding key numbers on this coupon, and mail the coupon to THE TOOL ENGINEER.

Tools of Today Department, THE TOOL ENGINEER
550 West Lafayette Blvd., Detroit 26, Michigan

Gentlemen:

Please send me further information on the following Tools of Today items which I have checked:

T-11-1 T-11-2 T-11-3 T-11-4 T-11-5 T-11-6 T-11-7 T-11-8 T-11-9 T-11-10
T-11-11 T-11-12 T-11-13 T-11-14 T-11-15 T-11-16 T-11-17 T-11-18 T-11-19 T-11-20
T-11-21 T-11-22 T-11-23 T-11-24 T-11-25 T-11-26 T-11-27 T-11-28 T-11-29 T-11-30
T-11-31 T-11-32 T-11-33 T-11-34 T-11-35 T-11-36 T-11-37 T-11-38 T-11-39

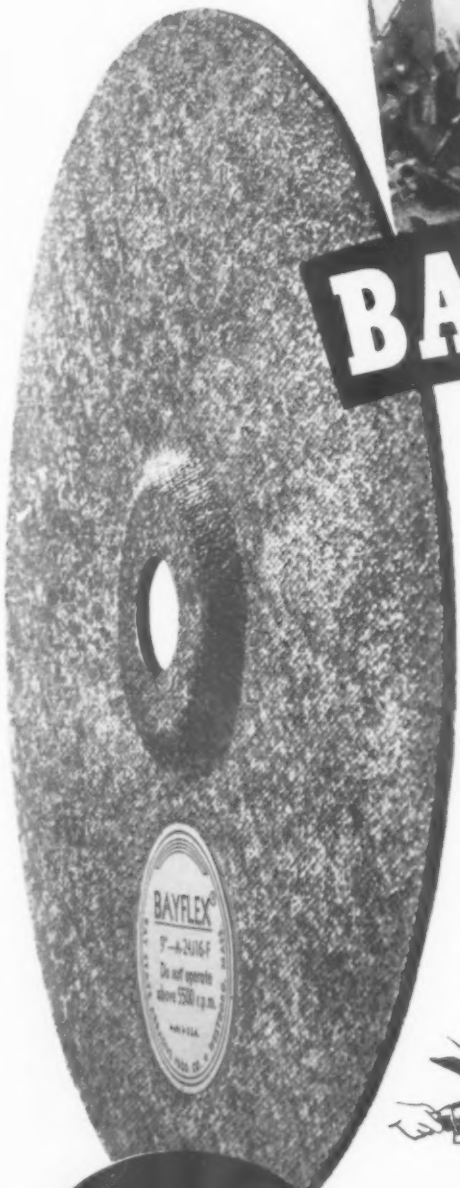
Name .....

Position .....

Firm .....

Street..... City, State.....

Christopher Columbus landing in the New World October 12, 1492.



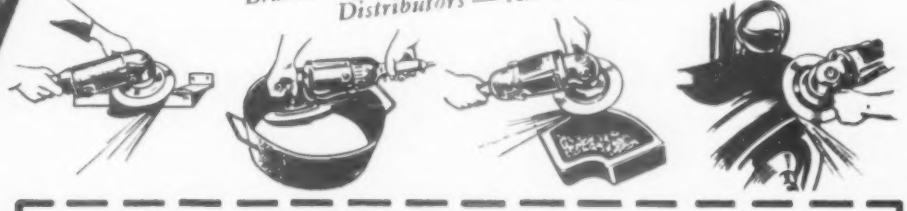
BAYFLEX is worth discovering too!

Columbus' discovery proved to be one of the most valuable discoveries in history . . . and *Bayflex Raised Hub Disc Wheels* have proved to be a remarkable "find" too, by foundries, welding shops, metal fabricating shops, automobile and truck body repair shops, for removing unwanted metal *faster — easier — cleaner.* Operators are pleasingly surprised with production possibilities and their increased piece-work earnings.

Bayflex discs 1/8" and thicker are made of multi-layers of cotton fiber loaded with sharp abrasive grit — flexible yet extremely strong — can be used for edge as well as surface cutting giving "40 to 1" life, and more, over conventional discs.

Words cannot fully describe this new wheel, you must see it in operation. Send coupon today for a demonstration.

BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO, MASSACHUSETTS, U. S. A.
Branch Offices and Warehouses Chicago — Detroit
Distributors — All Principal Cities



BAY STATE®

Bay State Abrasive Products Co. Westboro, Mass.

Please have your representative call just as soon as possible to demonstrate Bayflex Raised Hub Disc Wheels. It is understood that this will not obligate us in any way.

Company.....

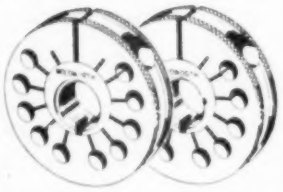
Street.....

City..... State.....

Individual.....

Woodworth Engineered Products

PRECISION GAGES



Woodworth manufactures a complete line of thread ring and thread plug as well as cylindrical plug and ring gages. Also produce special gages to customer blueprints.

PRECISION PARTS

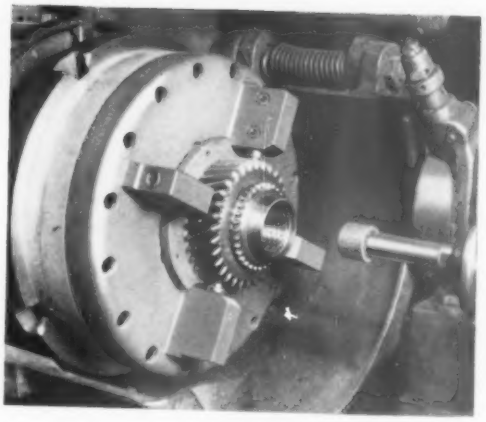
N. A. Woodworth engineering gives you plus value in precision parts. Production men with "know how" combined with well equipped plant are pace setters in aircraft engine and radar assembly fields.

CONE-LOK JIGS

Woodworth Cone-Lok Jigs are noted for their mechanical simplicity and "lifetime" construction.

DIAPHRAGM CHUCKS

Chucks engineered and built by Woodworth guarantees the ultimate in precision gear chucking.



ACCURACY YOU CAN TRUST

WOODWORTH

N. A. WOODWORTH CO., 1300 EAST NINE MILE ROAD • DETROIT 20, MICHIGAN

COMPLETE LINE OF PRECISION GAGES • DIAPHRAGM CHUCKS • CONE-LOK JIGS

BAKER *Versatile Model*

3 x 12 HYDRAULIC FEED SADDLE UNIT...

With readily exchangeable Hydraulic Feed Power Unit outside the machine base.

The new Baker one to three H.P. hydraulic feed unit is readily adaptable to special machine application as either a primary or auxiliary unit. Units may be mounted in vertical, horizontal or angular position and are adaptable to single or multiple spindle operations. A completely separate mobile pump-sump unit mounted on casters provides hydraulic power for the Baker 3 x 12 unit through only two self-sealing couplings, designed to allow rapid exchange of power units whenever desirable. For more information write for Baker 3 x 12 circular No. 69946.

Domestic Dealers of BAKER Machinery

Anderson Machine Tool Co., St. Paul, Minn.

Mr. James W. Barr, P.O. Box 336, Tuckahoe, N. Y.

Buckner-Weatherby Co., Inc., Seattle, Wash.

Chandler Machinery Co., Atlanta, Georgia

Glenn D. Swander Machine Tools, New Orleans, La.

Jeffreys Engineering & Equipment Co., Raleigh, N. C.

George Keller Machinery Co., Buffalo, N. Y

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Motch & Merryweather Machinery Co., Cleveland—Detroit—Cincinnati—Pittsburgh

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Stedfast & Roulston, Inc., Boston, Mass.

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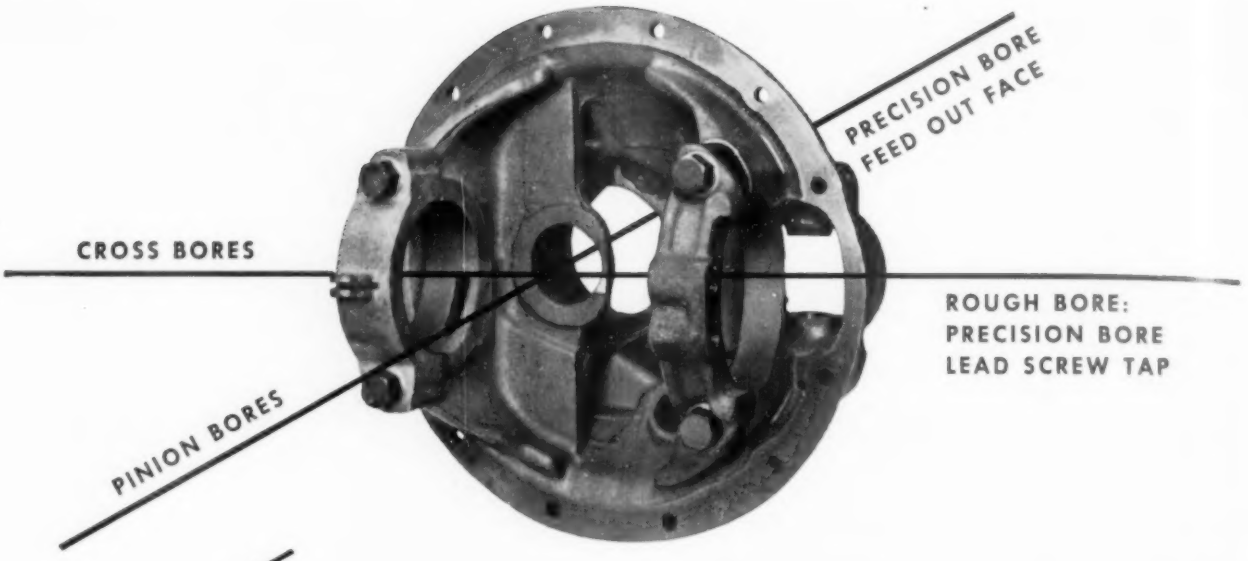
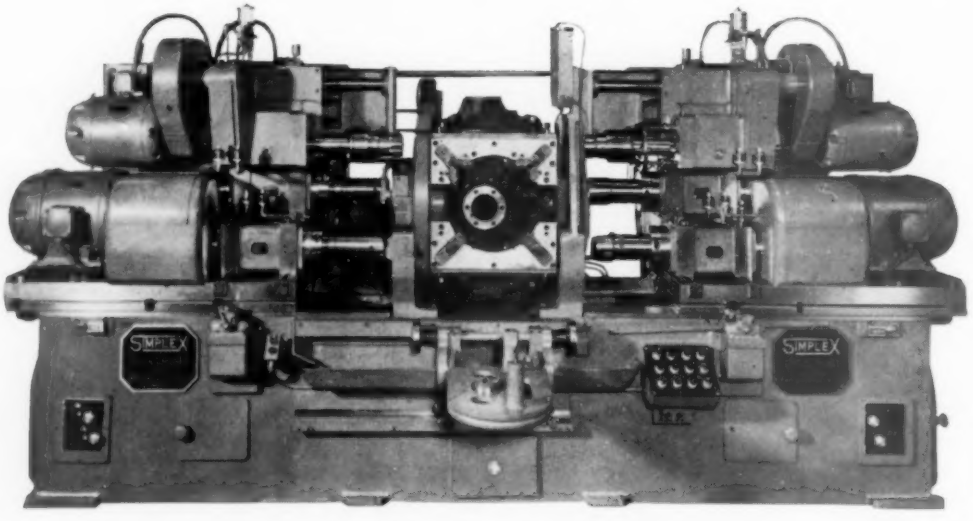
BAKER BROTHERS, Inc., Toledo, Ohio

DRILLING, BORING, TAPPING and KEYSEATING MACHINES



MARKS THE SPOT WHERE *Precision Pays Off*



A Prominent Manufacturer of Axles greatly increased production, practically eliminated Axle tear down after assembly and lowered costs with these SIMPLEX 3-way Precision Boring Machines. A four-position indexing fixture permits loading on Station No. 1; Rough Boring Cross Bores on Station No. 2; Precision Boring Cross Bores, Pinion Bore and Feed Out Facing Pinion Bore on Station No. 3; Lead Screw Taping of Cross Bores on Station No. 4. A Production of 40 Carriers per Hour has been achieved on this large Truck type differential Carrier. Smaller Car Carriers would permit considerably higher production rates.

Simplex **PRECISION BORING MACHINES**

SIMPLEX MACHINE TOOL DIVISION
STOKERUNIT CORPORATION
4528 WEST MITCHELL STREET
MILWAUKEE, WISCONSIN

PRECISION BORING MACHINES • PLANER TYPE MILLING MACHINES • SPECIAL MACHINE TOOLS

PRECISION FINISHED in 23 seconds

Fellows "Full-Tool" Shaving More Than Doubles Output . . . Prolongs Tool Life

Shaving as a finishing process can now play an important role in low-cost mass production. The Fellows "Full-Tool" method permits a shorter stroke, provides freer cutting and higher reciprocating speeds and consequent greater output. Cutting action is so distributed as to obtain an even finer tooth finish with less wear on the shaving tool.

Every production-minded manufacturer will want to know more about this new method of low cost gear finishing. For more complete information contact our nearest office.

GEAR SPECIFICATIONS

Material (Steel Forging)	S.A.E. 1024
No. of teeth	23
Normal pitch	10
Normal pressure angle	14°
Helix angle	42° 36′ 30″
Face width	1″
Lead limit	.0002″
Involute limit	= .0004″

Fellows

THE FELLOWS GEAR SHAPER COMPANY

Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Bldg., Detroit 2; 640 West Town Office Bldg., Chicago 12; 7706 Empire State Bldg., New York 1.

GEAR SHAPERS · THREAD GENERATORS · CUTTERS · SHAVING AND BURNISHING MACHINES
GEAR MEASURING AND INSPECTION INSTRUMENTS · PLASTICS MOLDING MACHINES

job tested!

One of the big advantages of using standard Hannifin Hydraulic Presses is that you get modern "JOB TESTED" designs of highest quality. Hannifin gives you everything you want for fast, accurate production: ram speed and stroke to meet work requirements...tables and fixtures arranged for top efficiency...controls to suit your needs. For detailed engineering recommendations, see your local Hannifin representative or write.

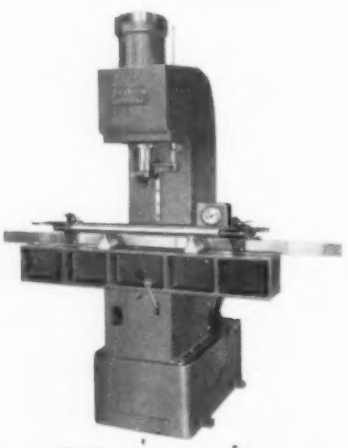
(Left) Precision truing of a spindle on a 75-ton Hannifin Straightening Press equipped with exclusive Sensitive Pressure Control *at Monarch Machine Tool Co., Sidney, Ohio.*

HANNIFIN

HYDRAULIC PRESSES

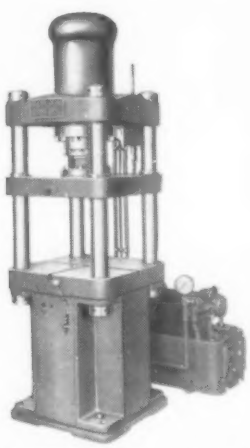
SERIES F FORCING PRESSES

10 standard models. Capacities from 6 to 150 tons. *Sensitive Pressure Control* standard equipment. Built-in power unit. Stroke adjustable. All-steel welded frame; normalized.



SERIES S STRAIGHTENING PRESSES

17 standard models. Capacities from 6 to 150 tons. *Sensitive Pressure Control* standard equipment. Choice of center type or roller vee fixtures; spring mounted.



SERIES C COLUMN TYPE PRESSES

48 standard models. Capacities from 6 to 150 tons. Any bed size. 2 or 4 columns. Manual, automatic or semi-automatic control. Furnished with or without platen.

Ask for a Copy of this NEW CATALOG!

Out of this 20 page catalog on *standardized* Hannifin Hydraulic Presses, it is easy to select the press you need for forcing, straightening, forming, assembling, broaching, and similar operations. Contains detailed information on design and construction and useful engineering data. Ask for free copy of Bulletin No. 130-J.

HANNIFIN CORPORATION

1101 S. Kilbourn Ave. Chicago 24, Illinois

AIR CYLINDERS • HYDRAULIC CYLINDERS • HYDRAULIC PRESSES
PNEUMATIC PRESSES • HYDRAULIC RIVETERS • AIR CONTROL VALVES

Nationwide Sales and Service

EXTRA PROFITS COME FROM GROUPING OPERATIONS

ONE operator handles both drilling and tapping at almost DOUBLE the production formerly obtained by TWO operators

Two operators drilling and tapping separately 6 holes, 7/64" in diameter, were producing 1500 to 1800 completed die cast parts an hour.

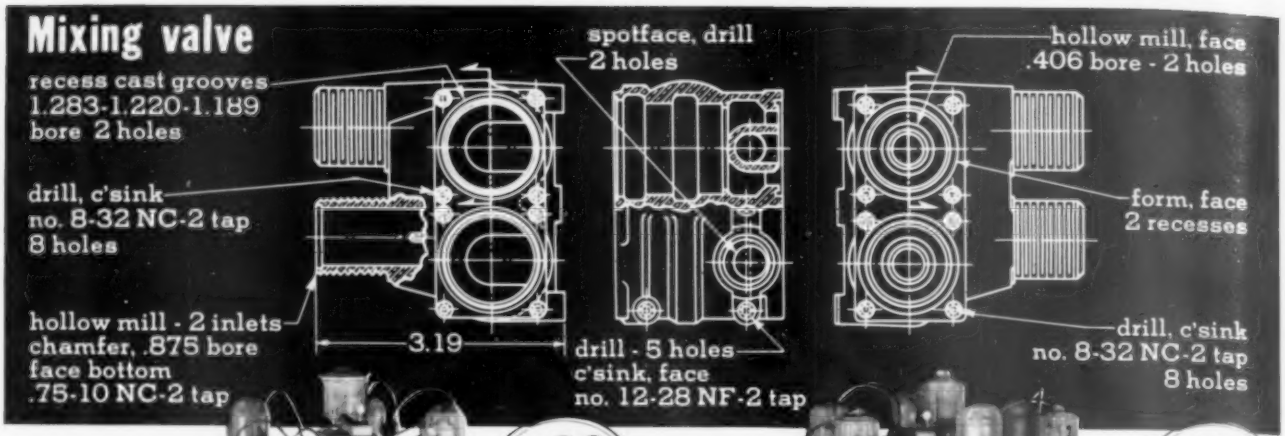
By grouping the two operations on one simple, inexpensive, tool-room-built unit, fed by Bellows "Controlled-Air" Powered Feeds (electrically synchronized) one man performs both operations and obtains almost double the production — 2500 to 3000 complete pieces per hour.

Multiple operations on the same work piece can often be grouped and handled automatically with inexpensive tool-room-built special purpose machines made by combining standard machine tool units with Bellows "Controlled-Air" Power Feeds.

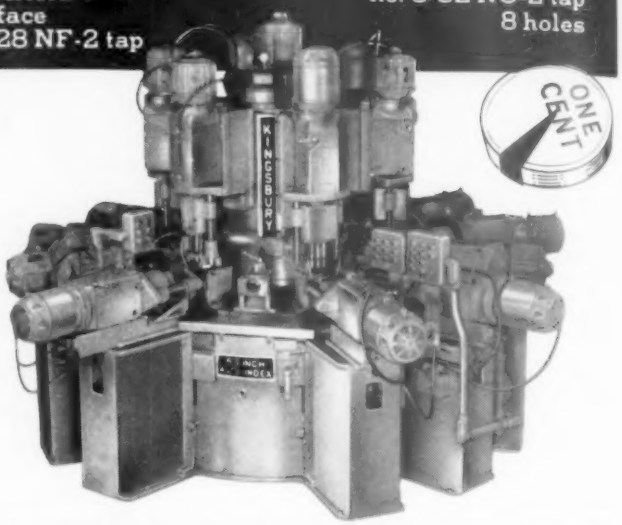
Bellows "Controlled-Air" Power Feeds advance work or tools a pre-determined distance, under a pre-determined thrust. Traverse speeds are independently controlled and are adjustable to any desired degree. As many as fourteen electrically-controlled Bellows Feeds may be synchronized to operate automatically with a single work holding fixture.

The Bellows "Controlled-Air-Power" Feed is typical of Bellows "Controlled-Air-Power" Equipment designed for faster, safer, better production. Write today for descriptive bulletins showing our complete line of Air Motors, Cylinders, Presses, Work Holding and Feeding Equipment.

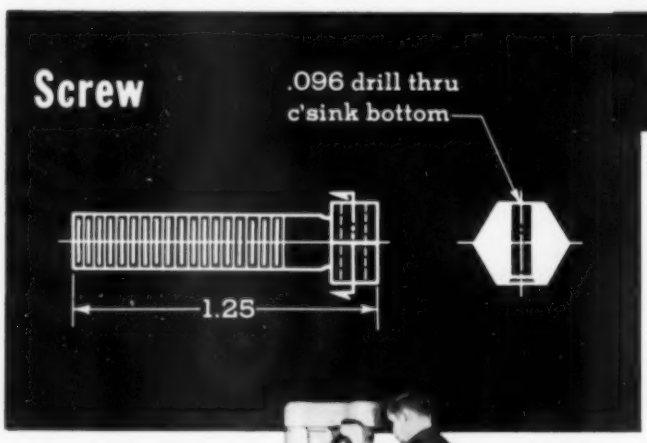
The Bellows Co.
AKRON, OHIO



A horizontal indexing machine with central column has 16 units that perform the operations above at the left. The machine has a 60-inch power index table with 12 stations. 30 spindles. 475 parts an hour gross. 7/100¢ per operation.



A second similar machine completes the operations. The central column supports 6 vertical units, and knees bolted to the base 11 horizontal units. Bushings guide the drills. 45 spindles. 462 parts an hour gross. 5/100¢ per operation.



A vertical machine has a drilling unit, a countersinking attachment underneath and a V-block fixture with automatic ejection. The operator merely loads. The rest is automatic. 2 spindles. 1440 parts an hour gross. 10/100¢ per operation.

Accurate operations

Man and machine together cost a fraction of 1¢ per tool per part. On the simple job at left only 10/100 of 1¢. On the complex job above only 6/100 of 1¢. For that fraction of a penny every part is uniform, and every operation is in exact location.

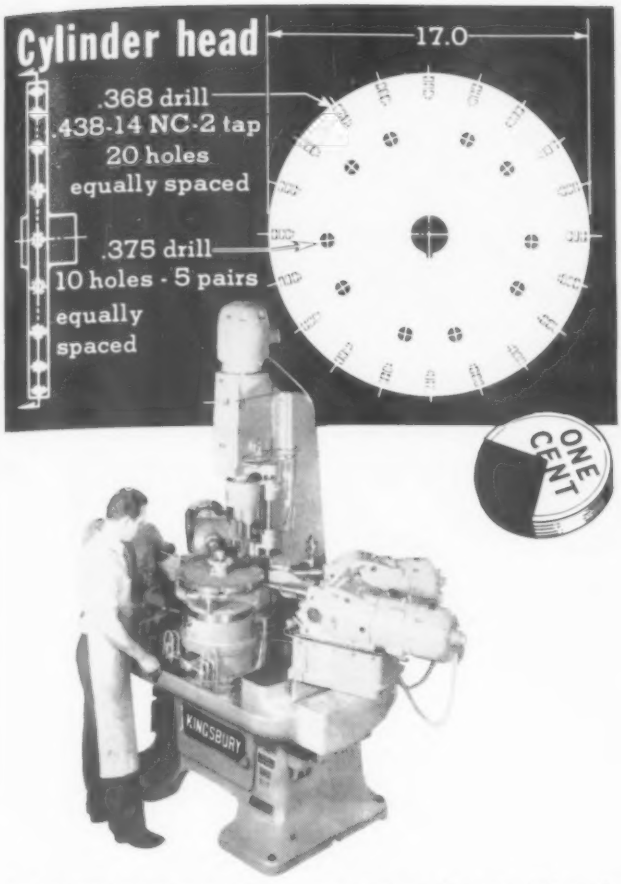
Many all-purpose machines can do these operations. But none can match the cost. Few can match the accuracy and uniformity. Here is why:

More output per man hour. One machine performs many operations at a high production rate.

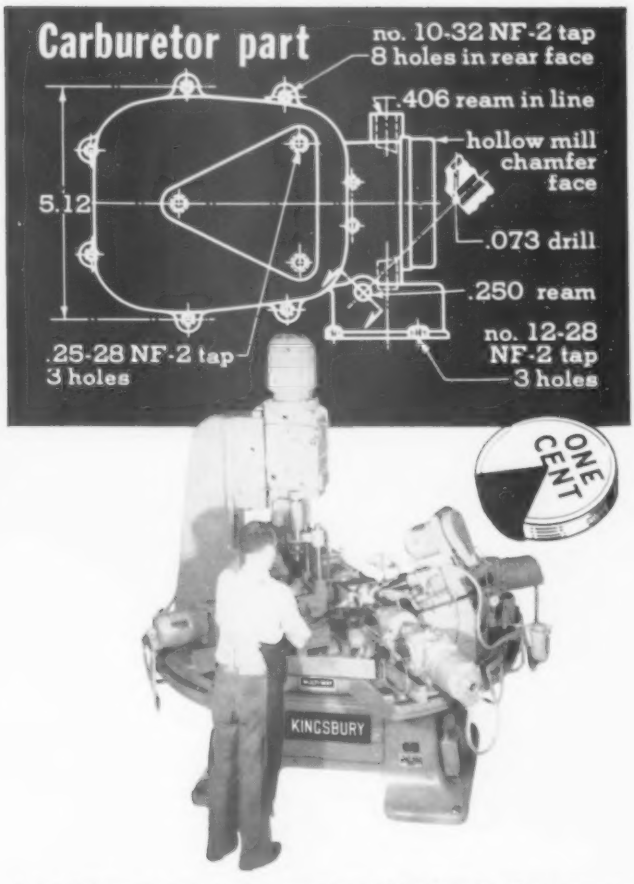
Uniform product. Automatic work cycles never vary. Fixtures that index are exact duplicates.

Accuracy. No handling or relocating of work until finished. Bushings guide drills and reamers.

KINGSBURY



An indexing fixture rotates one part on its axis 36° each index. Two pairs of units drill and tap 20 holes. One unit with 2-spindle head drills two .375 holes every other index. 6 spindles. 24 parts an hour gross. 27/100¢ per operation.



A multi-way non-index machine has 7 units that operate from 5 directions in 2 chuckings. The operator changes parts in one fixture while units operate on a part in the other. 18 spindles. 150 parts an hour gross. 16/100¢ per operation.

at amazing low cost

Less handling, less space. Fewer machines.

Superior construction. We use 11 jig borers, 9 boring machines, homocarb and relieving furnaces, induction heater, gear shaver, thread grinder, etc.

Short pay-off period. Usually 1 to 3 years.

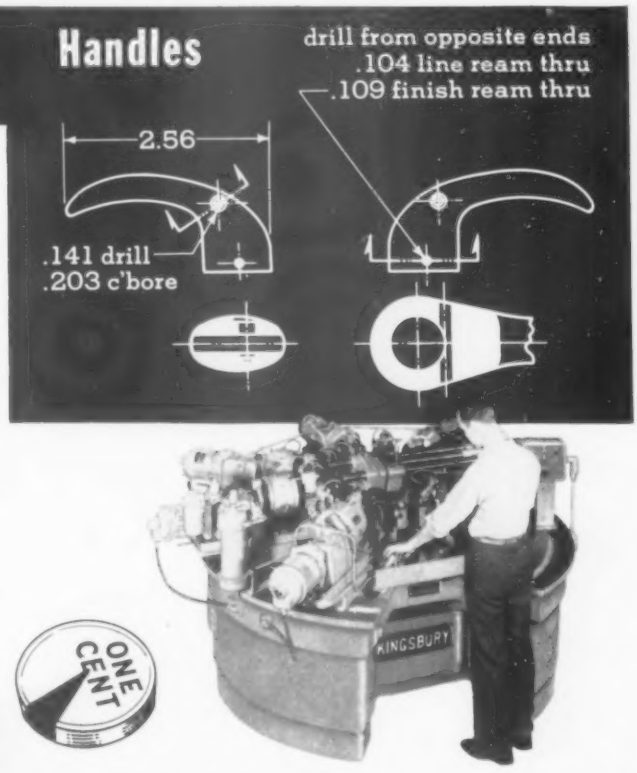
Proposals. If you have a high production job with operations like these, ask our Mr. L. A. Carll for a proposal on a tooled machine. Send him a print showing the operations and hourly output you need. Free bulletins show 40 setups. Kingsbury Machine Tool Corp., 20 Laurel St., Keene, N. H.

(For every cost here we figured on a generous wage rate. We assumed the machine would run at 80% efficiency for 6000 hours, a fraction of its useful life. No power or overhead.)

83

AUTOMATIC DRILLING AND TAPPING MACHINES

for Low-Cost High Production



A horizontal indexing machine has 6 units with 2-spindle heads. Each works on a left and a right hand part at the same time. Clamping, unclamping and ejection is automatic. 12 spindles. 642 pairs an hour gross. 7/100¢ per operation.

At the production rate of three pieces per minute, the S. K. Wellman Company of Cleveland, Ohio, is performing grooving operations on powdered metal aircraft parts approximately four times faster than ever before. This has been achieved by incorporating several automatic devices with a standard Walker-Turner Radial Cut-Off Machine to convert it into an automatic-radial grooving machine.

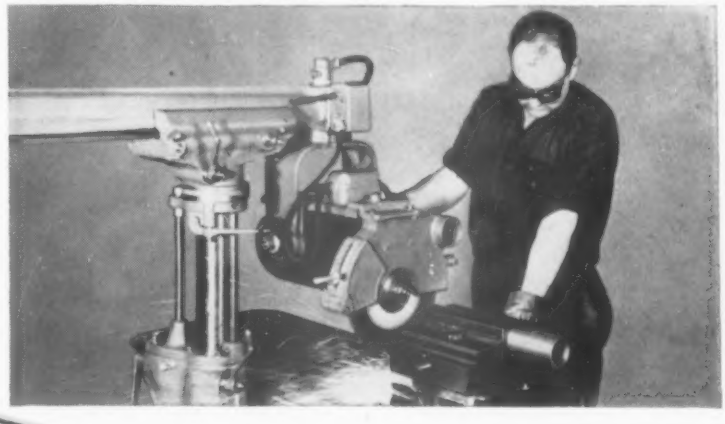
For this grooving operation the Radial Cut-Off Machine is equipped with a diamond impregnated metal wheel to do the cutting, and a magnetic chuck for work holding. The sliding head is motivated by an air cylinder with provisions for metering the feed. With this set-up extremely accurate work is done—the depth of each groove held within .003", and the accuracy of the index within .005".

In addition to increased production, Walker-Turner Machine Tools have given the S. K. Wellman Company continued operation with trouble-free maintenance. Says Mr. S. E. Truesdell of the company's engineering department: "Three Walker-Turner machines have been in our possession about five years, and in that period a very minimum, if any, maintenance has been required. We find these machines ... *are highly adaptable to intricate machining jobs with minimum set-up time.*"

For complete catalog, write to Walker-Turner Division, Kearney & Trecker Corporation, Plainfield, New Jersey.

Photo left: Radial Cut-Off Machine in S. K. Wellman set-up for radial grooving with magnetic chuck and diamond wheel. Indexes automatically at the end of each ram traverse cycle.

Photo, below: Radial Cut-off Machine, Model MRA-1130, 3 h.p., 3450 r.p.m. motor. Price: Less abrasive wheel, magnetic overload release and base $485.00.



FOR EXAMPLE

GROOVING OPERATIONS 4 TIMES FASTER
by S. K. WELLMAN COMPANY
with WALKER-TURNER radial cut-off machine

walker-Turner **MACHINE TOOLS**

DRILL PRESSES—HAND AND POWER FEED
RADIAL DRILLS • RADIAL SAWS
BAND SAWS—FOR WOOD OR METAL
RADIAL METAL CUT-OFF MACHINES • MOTORS

SOLD ONLY BY AUTHORIZED INDUSTRIAL MACHINERY DISTRIBUTORS

Nothing can be

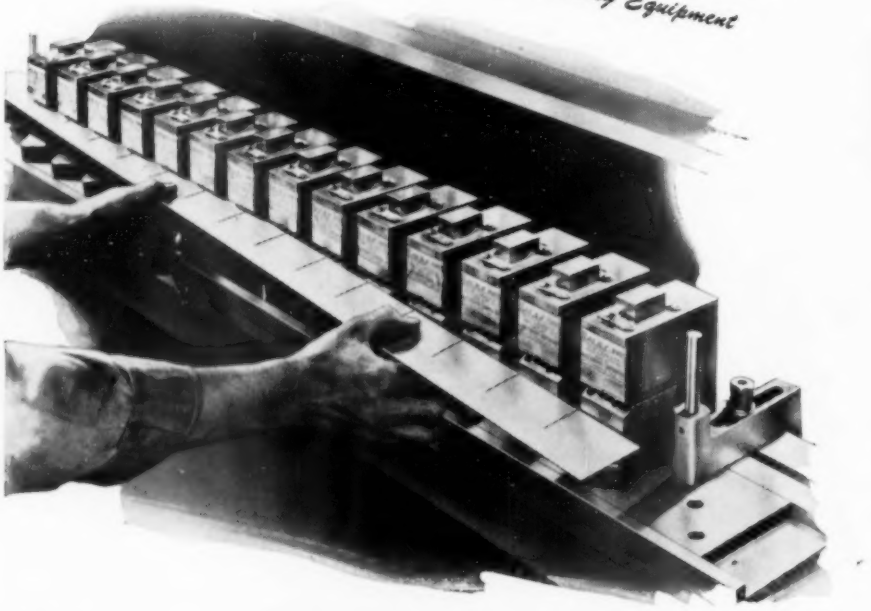
~~WHAT COULD BE~~ SIMPLER THAN NOTCHING

FLUORESCENT LOUVERS WITH

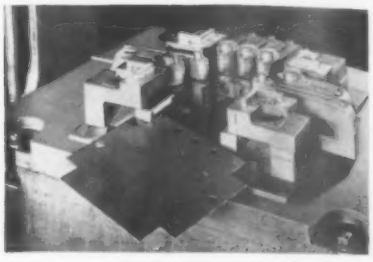
WALES EQUIPMENT

Specialists in Hole Punching and Notching Equipment

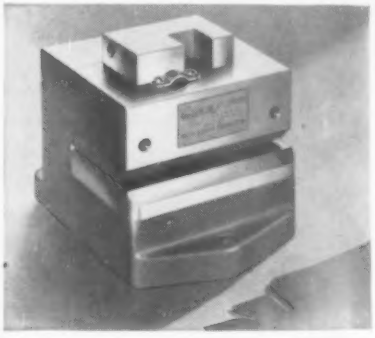
TYPICAL STANDARD AND SPECIAL NOTCHING UNITS



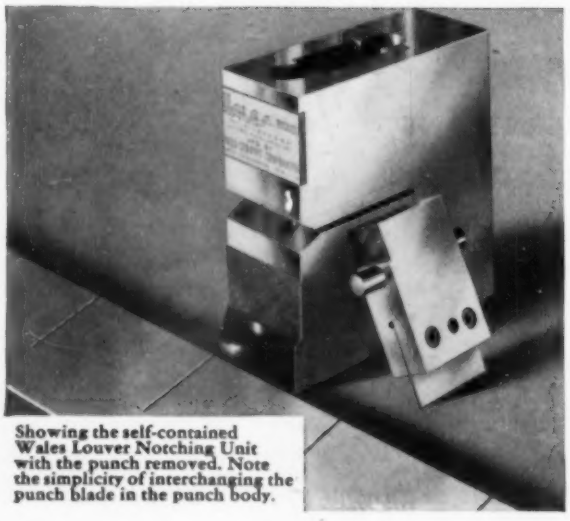
A group of Wales Louver Notching Units in operation in a press brake. Note the long narrow notches in the louver strip.



Showing four Wales Notching Units combined with Wales Type "BL" Hole Punching Units in a press setup.



Showing a special Wales Notching Unit which notches the unusual irregular shaped corner notch shown in the foreground. This partially illustrates the wide possibilities of special Wales Notching Units.



Showing the self-contained Wales Louver Notching Unit with the punch removed. Note the simplicity of interchanging the punch blade in the punch body.

● There is always something new in the Wales Line. This time it's a new type Notching Unit made specially for Fluorescent Light Fixture Manufacturers. Reports from manufacturers using these Units prove that the *Best Way* is the *Wales Way*.

Wales Notching Units are self-contained with punch and die in perfect alignment which reduces punch breakage to a minimum. The patented design of Wales Equipment permits the same group of units to be used in unlimited setups at various centers for varying lengths and widths of fluorescent louvers. Practically no press "down-time" ...one stand-by unit may be substituted in the operating setup for a unit with dull punch.

Send prints or samples of the work and press specifications for Wales Engineers recommendations.

WALES-STRIPPIT CORPORATION

George F. Wales, President

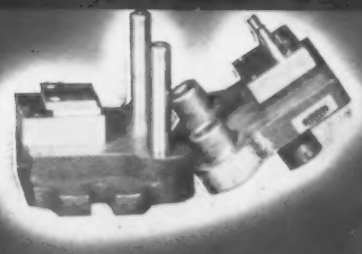
393 **PAYNE AVENUE, N. TONAWANDA, N. Y.**

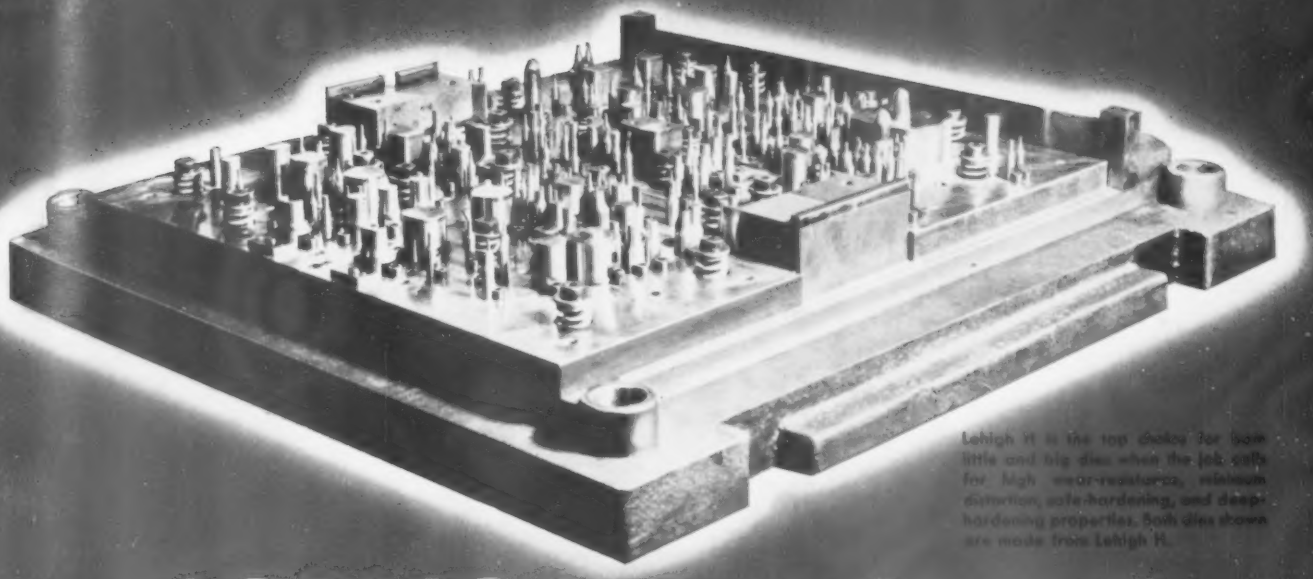
(Between Buffalo and Niagara Falls)

WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONTARIO

Specialists in Punching and Notching Equipment

Little dies and BIG dies





Lehigh H is the top choice for both little and big dies when the job calls for high wear-resistance, minimum distortion, safe-hardening, and deep-hardening properties. Both dies shown are made from Lehigh H.

# of LEHIGH H tool steel

for maximum production

Lehigh H has a high-carbon, high-chromium composition with characteristics that make it the aristocrat of tool and die steels. And here's how this fine steel is put to best use:

For maximum production. Lehigh H, due largely to its high-carbon content, is first choice wherever resistance to wear and abrasion is a big factor. Use it for long runs.

For close tolerances. Lehigh H is air-hardening, with the very minimum of change in size and shape during heat-treatment.

For safe hardening. Lehigh H is cooled in still air from a hardening temperature of 1850 F. It eliminates cracking hazards for intricate dies, thin sections, short radii.

For severe service. Lehigh H is extremely deep-hardening, even in large sections. It has high compressive strength for heavy-duty tools and dies.

Here's a grade of tool steel that's been proved by years of making good in toolrooms and production lines. It's most frequently used for tools and dies for blanking, punching, forming, shearing and bending. Use it also for lamination dies, shear blades, drawing dies, wearing plates, taps, gages, bending rolls . . . wherever you need great accuracy in size, long runs, and a steel that is bred for severe service.

	C	Cr	V	Mo
Typical Analysis:	1.55	11.50	0.40	0.80

Working Hardness: Rockwell C 58 to 62

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor:
Bethlehem Steel Export Corporation

BETHLEHEM STEEL

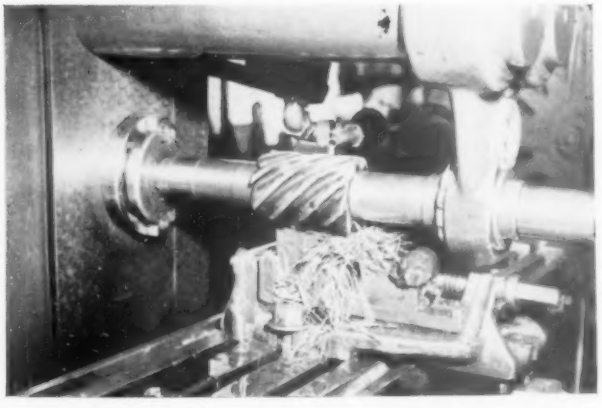
LEHIGH H . . . one of Bethlehem's Fine Tool Steels

RESTORE BROKEN TOOLS THIS QUICK, EASY WAY WITH EASY-FLO

1. Here, for example, is a milling cutter that looks about ready for the scrap heap. But see how simply it was reclaimed with the low-temperature silver brazing alloy EASY-FLO and its teammate Handy Flux.

2. Here's the brazing set-up. Parts are cleaned and simply placed together with a weight to hold them in place. Internal heat, in this case, is supplied by a carbon rod in the bore, shorted across a transformer.

3. Here's the job in process. Outside heating is done with an oxyacetylene torch which is kept moving back and forth to secure uniform heating and EASY-FLO is applied by hand.



4. And here's the cutter, back on the job, good as new. All kinds of milling and form cutters, broaches, drills, taps, circular and band saws, are now being repaired the fast, low-cost EASY-FLO brazing way.

BULLETIN 14 gives full details about the EASY-FLO method, with step-by-step directions. Write for a copy today.

(Photos courtesy of Henry Disston Saw Co., Toronto)

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Agents in Principal Cities

Check Your Procedure In The Red Ring Gear Laboratory *Before* You Start Gear Production

THE Red Ring Gear Laboratory has been organized for your convenience and assistance. You may have a pilot job you want produced or a limited number of special gears, perhaps gears having very close tolerances which you need for experimental or research work. You may have questions involving gear design, the choice of gear materials, methods of processing, heat treatment, or gear finishing.

The Red Ring Gear Laboratory, with its staff of gear specialists and full complement of gear processing machinery, can help you solve these problems and turn out gears for you in limited quantities—any type of spur or helical gear and to any degree of precision.

Red Ring Gear Engineers will be very glad to discuss with you any problem in this field. The gear laboratory is not set up for production runs of any type of gears.

Gear used in radar equipment having 42 teeth, 26.4810 N.D.P., 18°-15'-22" N.P.A. and a right hand helix angle of 25°. Also external and internal splines having 10 teeth, 20 N.D.P., 30° N.P.A. and 31°-34'-26" helix angle. Units had to assemble on a nonselective basis.

Marine reduction gear having 61 teeth, 7 N.D.P., 18° 17' N.P.A. and a 24°-45'-43" helix angle.

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN • • • • • • • • • DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

IMPROVED for higher operating efficiency . . .

IMPROVEMENTS START HERE

NEW WHEEL SPINDLE FEATURES

- Choice of two styles of completely self-contained spindle units—
  Plain-Bearing with automatic compensation for wear or *Antifriction-Bearing* with sealed grease lubrication
- Simple V-belt spindle drive protected by guard. 3 wheel speeds, quickly obtainable
- Upright base graduated to 110 degrees each side of zero.
- Lever facilities swiveling upright
- Single bolt clamps spindle slide upright

BROWN &

. . . the NEW DESIGN No. 13 UNIVERSAL & TOOL GRINDING MACHINE

BETTER PERFORMANCE STARTS HERE

This general-purpose No. 13 Universal & Tool Grinding Machine embodies many outstanding refinements in design and construction . . . engineered to simplify its set-ups, increase its versatility and prolong its service life. Automatic lubrication now protects all major mechanisms and bearing surfaces. In addition, it has all the broad utility and flexibility of the previous model. With this *new design* No. 13, you can increase the efficiency of such toolroom operations as the grinding of small and medium sized cylindrical work, form grinding, sharpening milling cutters, reamers and similar tools and miscellaneous other types of work. *Capacity:* centers swing 8" in diam.; take 24" in length.

Checklist OF IMPROVEMENTS

- Improved Wheel Spindle and Headstock
- 6 table speeds from 7¾" to 100" a minute
- New "bumping" control knob for table adjustment
- 4 changes of work speeds
- Automatic lubrication
- Built-in electrical controls meet MTE standards

MOTOR-DRIVEN HEADSTOCK

- 4 work speeds for dead-center or revolving-spindle grinding.
- Headstock spindle mounted on preloaded antifriction bearings.
- Angular settings to 100° each side of zero.

NEW CORRELATION OF CONTROLS

- Related grouping of all control permits maximum output . . . minimum operator fatigue.
- 6 rates of table speeds . . . changed from front of machine. Table has individual (¼ H.P.) motor drive.
- Convenient start-stop lever for headstock spindle and power table movement — or headstock only.

For complete specifications and descriptions of the new design No. 13, write Brown & Sharpe Mfg. Co., Providence 1, R.I., U. S. A.

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Faster METAL REMOVAL

with HAYNES STELLITE *metal-cutting tools*

HAYNES STELLITE metal-cutting tools remove metal faster by making heavier roughing cuts with heavy feeds. Long tool life between grinds is assured because HAYNES STELLITE tools are balanced in red-hardness, edge-strength, toughness, and abrasion resistance. The result is greater production at lower cost per piece machined.

HAYNES STELLITE cutting tools are especially suitable for turning, facing, boring, grooving, forming, and milling most types of steel and cast iron. These tools are also widely used for machining practically all types of non-ferrous metals and non-metallic materials.

You can order HAYNES STELLITE standard tools, or special tools made to your specifications, through any Haynes Stellite Company office. For more descriptive information, write for the new revised edition of "HAYNES STELLITE Metal-Cutting Tools," Form 5401.

HAYNES *alloys*
TRADE-MARK

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Unit of Union Carbide and Carbon Corporation
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The registered trade-marks "Haynes" and "Haynes Stellite" distinguish products of Haynes Stellite Company.

Does INSPECTION

cost you money

OR

save you money?

Old-fashioned methods of dimensional inspection definitely increase your costs—because they find errors only *after* the scrap and rework are made. An inspection system should catch the errors *before they happen!*

Visible gaging—Dial Indicator Gaging — offers major advantages over old-fashioned *feel-your-way* methods. The Dial Indicator gives you the reading at a glance. Human error is minimized; the sense of sight is more dependable than the sense of feel. Moreover, if the workpiece is off-size, the Dial Indicator tells you exactly which way and exactly how much. This means greater salvage, less scrap.

This photograph shows an application of the Dial Indicator to the gaging of inside hole diameters. There are no blind spots for this gage; it tells you the exact dimension—in .0001"—*and every variation.* These gages are available in both portable and bench models—to inspect holes ranging from .122" to 12.665" in diameter.

We make both regular and custom-built gages to meet the needs of users in a hundred industries. For highly specialized needs, we also make Air Gages and Automatic Electronic Sorting Gages . . . Important applications of these two types of gages are shown on the opposite page.

COLOR FILMS AVAILABLE—LOANED ON REQUEST

(1) "The Dial Indicator" } on one
(2) "Dial Indicator Gages" } large reel

Showing fundamentals and uses

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FEDERAL PRODUCTS COPORATION

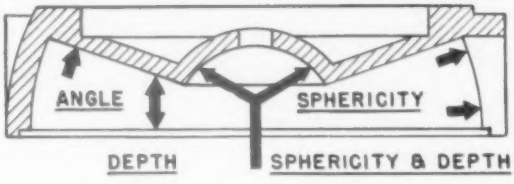
YOUR PROFIT DECISION IS *Visible** PRECISION

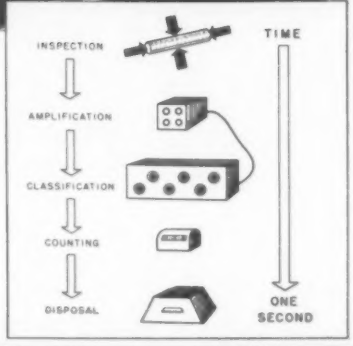
***The use of Dial Indicator Gages — visible precision — lowers inspection costs, raises production. Federal Products Corporation is America's largest maker of both regular and custom-built gages — mechanical, air, electronic — for the measurement of single and multiple dimensions.**

AIR GAGE INSPECTS
involved dimensions in liquid meter chamber

This Gage illustrates the exceptional possibilities of gaging involved dimensions simultaneously by air. It checks the internal side wall for sphericity and the conical section for angularity and depth. Simultaneously the concentricity of these three surfaces is checked relative to each other. The Dial Indicator checks the depth of the ball seat. Another Gage, used in conjunction, checks the sphericity of the ball seat when the two halves of the chamber are assembled. Such intricate gaging becomes simple with a Federal Air Gage.

Courtesy of Worthington-Gamon Meter Co. (subsidiary of Worthington Pump and Machinery Corp.)





ELECTRONIC GAGE
sorts pen barrels for length and diameter

This Electronic Sorting Gage segregates 3600 pen barrels per hour into eight size categories—for Esterbrook Pen Company of Camden, N. J.—*three times faster* than by previous methods. Barrels too short and too long are rejected first. Those O.K. for length are then sorted into four acceptable diameter groups each having spread of .002". Over and undersized diameters are rejected. Automatic counters keep tally of number of parts per category. Gage shuts off when count in any group reaches 1000.

Write for illustrated Bulletin 56 to receive detailed descriptions of the above gages. Let us help you with any problem of gaging and inspection. If you will send us blueprints of work to be measured, we will gladly recommend the proper gage. No obligation is involved.

FEDERAL PRODUCTS CORPORATION **1144 Eddy St., Providence 1, R. I.**
Represented in Canada by RUDEL MACHINERY COMPANY, LTD.

New and Improved VICKERS PRODUCTS

For Better Hydraulic Machinery

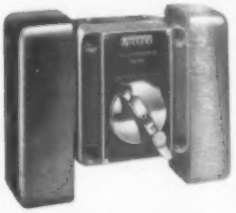
The Vickers units illustrated below are either new products or have recently been improved. Among their advantages are small size, and many have gasket mounting for even more compact hydraulic installations. For information regarding any of these new or improved units, ask for the Data Sheet or Bulletin number indicated.

VICKERS CHECK VALVE (In-Line Type)

For working pressures up to 3000 psi, this compact check valve can be furnished for piping sizes ¼", ¾" and 1½". Data Sheet 113720.

VICKERS FLOW CONTROL VALVE

Accurate control of oil flow in hydraulic systems (independent of pressure variation) can be obtained with this compact, gasket mounted unit. Bulletin 45-35.

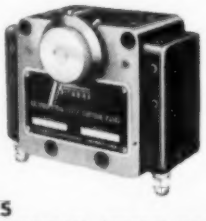


VICKERS CYCLE CONTROL PANEL (Solenoid Operated)

A compact unit for controlling rapid traverse and adjustable feed cycles with fully remote electrical cycle timing. Data Sheet 109164.

VICKERS FLOW CONTROL AND OVERLOAD RELIEF VALVE

Compact metering valve incorporates the Vickers patented flow control and relief valve for regulation of oil flow and pressure. Bulletin 48-36.

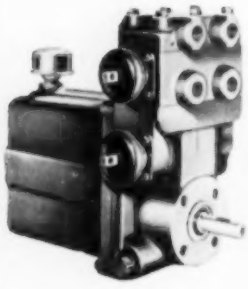


VICKERS RECIPROCATING CYCLE PANEL

For reciprocating cycles of machine tool carriages, etc., with accurate and selective reversal control. Data Sheet 80803.

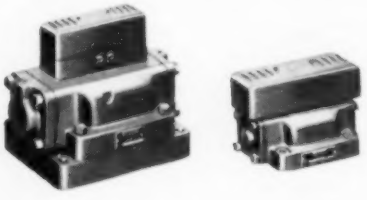
VICKERS PRESSURE SWITCH

Available in two models for pressure ranges 100-2000 and 500-3500 psi with independent pressure differential adjustment. Data Sheet 113929.



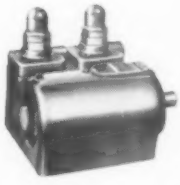
VICKERS POWER PACK

Vane type hydraulic pump, overload relief valve, oil tank, filter and operating valve are included in this low priced unit. Bulletin 46-48a.



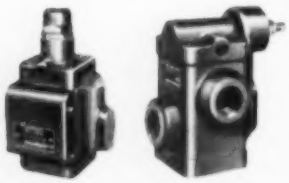
VICKERS SOLENOID OPERATED CONTROL VALVES

Compactness, simplified installation and minimum piping are but a few of many features. Bulletin 48-27.



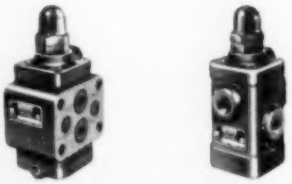
VICKERS TWO PRESSURE PUMP (Small)

Two vane type pumps and integral automatic valving, all combined in this compact unit, providing high-low pressure pumping action. Data Sheet 117994.



VICKERS PRESSURE REDUCING VALVES

Maintain accurate reduced pressure; available with integral free return flow check valve, gasket and screw connections. Data Sheets 101885, 100165.



VICKERS PRESSURE SEQUENCE CONTROL VALVES

These new sequence valves are available for smaller piping sizes, and are arranged either for gasket mounting or threaded-connections. Bulletin 45-34a.

VICKERS PROPORTIONAL OIL FILTER

This compact filter provides continuous micronic filtering for hydraulic systems at pressures up to 3000 psi. Bulletin 47-50.

3671

VICKERS Incorporated

DIVISION OF THE SPERRY CORPORATION

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The new Snyder plant is unique in that it was designed and built specifically for the production of special-purpose machinery and is one of the most perfectly equipped and efficient plants in the world. In nearly a quarter-century of operation the Snyder organization has created an immense variety of special-purpose machines for many industries—aircraft, automotive, coal mining, farm equipment, electrical, food processing, glass, oil, pharmaceutical, railroad, refrigeration, valve manufacturing, etc. Whether applied to production or to assembly, all these machines have a common objective—to control the factors which control costs (time, precision, finish, scrap, fatigue, safety) and thus to control profits. If your objective is high production at low unit cost, we invite your inquiries.

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Midvale Diamond Brand and Diamond-A high carbon, high chrom[illegible] tool steels meet customers' requirements for tools with high hardn[illegible] re-sistance to abrasion and minimum deformation. They differ i[illegible] this respect: air hardening Diamond-A is somewhat more machineabl[illegible] and slightly less resistant to abrasion than oil hardening Diamond B[illegible]and. Both can be forged, as well as machined. They have a wide vari[illegible]y of application, including dies, rolls, punches, gauges, saws, pape[illegible] mill knives, hobs, etc. Either can be depended upon to the limit.

THE MIDVALE COMPANY • NICETOWN • PHILADELPHIA

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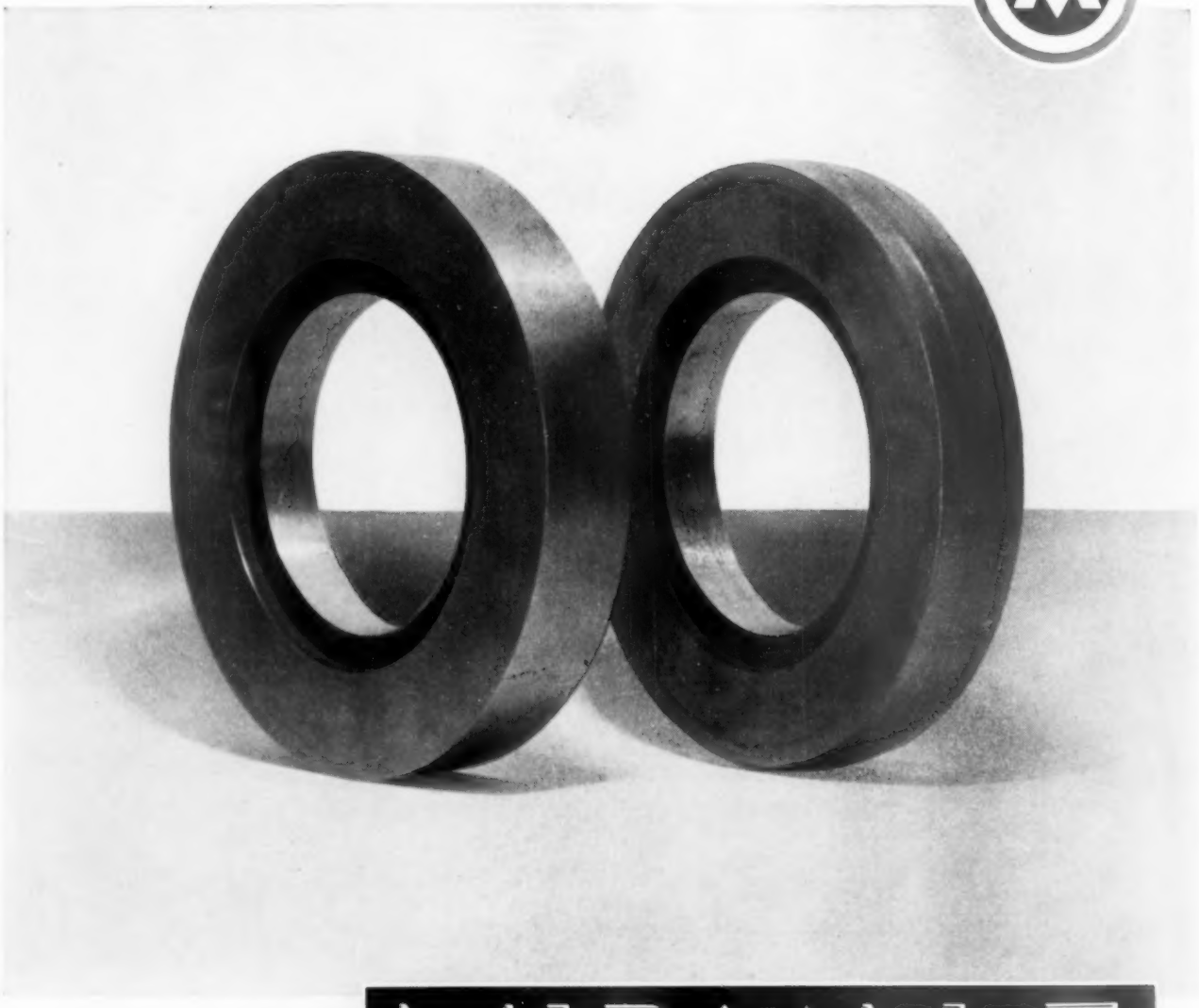

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CORROSION AND HEAT RESISTING CASTINGS
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FORGINGS AND RINGS

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Custom Steel Makers to Industry

Choosing the Right Stock Drill

- **Cuts Your Cost Per Hole**
- **Eliminates Breakage**
- **Speeds Production**

Yes, there are many advantages in selecting the right drill for each job. For instance, one of our customers was getting excessive breakage with regular jobbers' length drills on the set-up pictured here—drilling holes 7/16 inch deep in stainless steel. A *Cleveland* Service Representative was able to correct this situation by recommending a stub screw machine drill which, because of its heavier construction and shorter length, is giving complete satisfaction. *Your* drilling problems, too, perhaps can be solved by a *Cleveland* Service Representative—without cost or obligation. Contact our nearest Stockroom, or . . .

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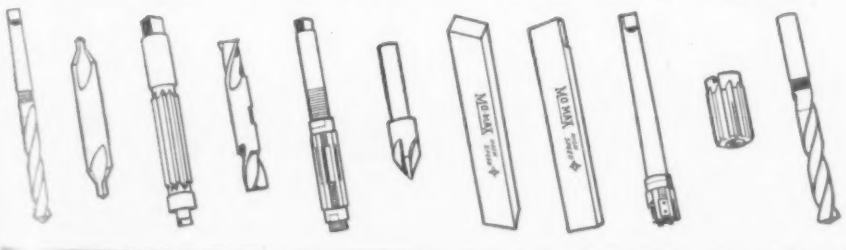

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are ready to serve you!

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.is the shortest path between two points

Probably you have never considered *Engineering* in this respect, but, in the manufacturing end of any business, engineering can be the determining factor between a safe cost figure and a competitive selling price. There are many steps in producing a product for market. Any one of these steps might be the "road block" in your planning for profit. From product design, through production methods and quality control of the finished item it is our business to establish the shortest path—the best way—to profitable manufacturing. We urge you to become better acquainted with our service and organization through our brochure . . .

The Answers

TO INDUSTRY'S PROBLEMS

This fact-packed, informative booklet tells how we can *engineer* a product from design to the shipping door — OR — merely step in and untangle your knotty problems. Please write on your business letterhead.

Pioneer Engineering and Manufacturing Company

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PIONEERing Better Production Methods and Tools

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Tool life, speed of cut, increased production depend upon the diamond tool. Smitite Dressers contain a number of small, whole diamonds, which may be completely consumed without resetting. They are evenly distributed throughout the sintered matrix, permitting several stones to contact the wheel. There are many types for rough- or finish-grinding, on wheels of any size and hardness.

Catalog on request

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"ROCKWELL" *Superficial* HARDNESS TESTER

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Where surfaces are smooth and materials homogeneous, tests made by the "ROCKWELL" Superficial Hardness Tester are as representative of the hardness as those made on the regular "ROCKWELL"—even though the depth of indentation is only .005" or less. This extremely shallow indentation makes possible the testing of very thin material, nitrided or lightly carburized steel or areas too small for a regular "ROCKWELL" test. This wide range of use accounts for the trend to the "ROCKWELL" Superficial Hardness Tester—*made only by Wilson.*

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MECHANICAL INSTRUMENT CO., INC.

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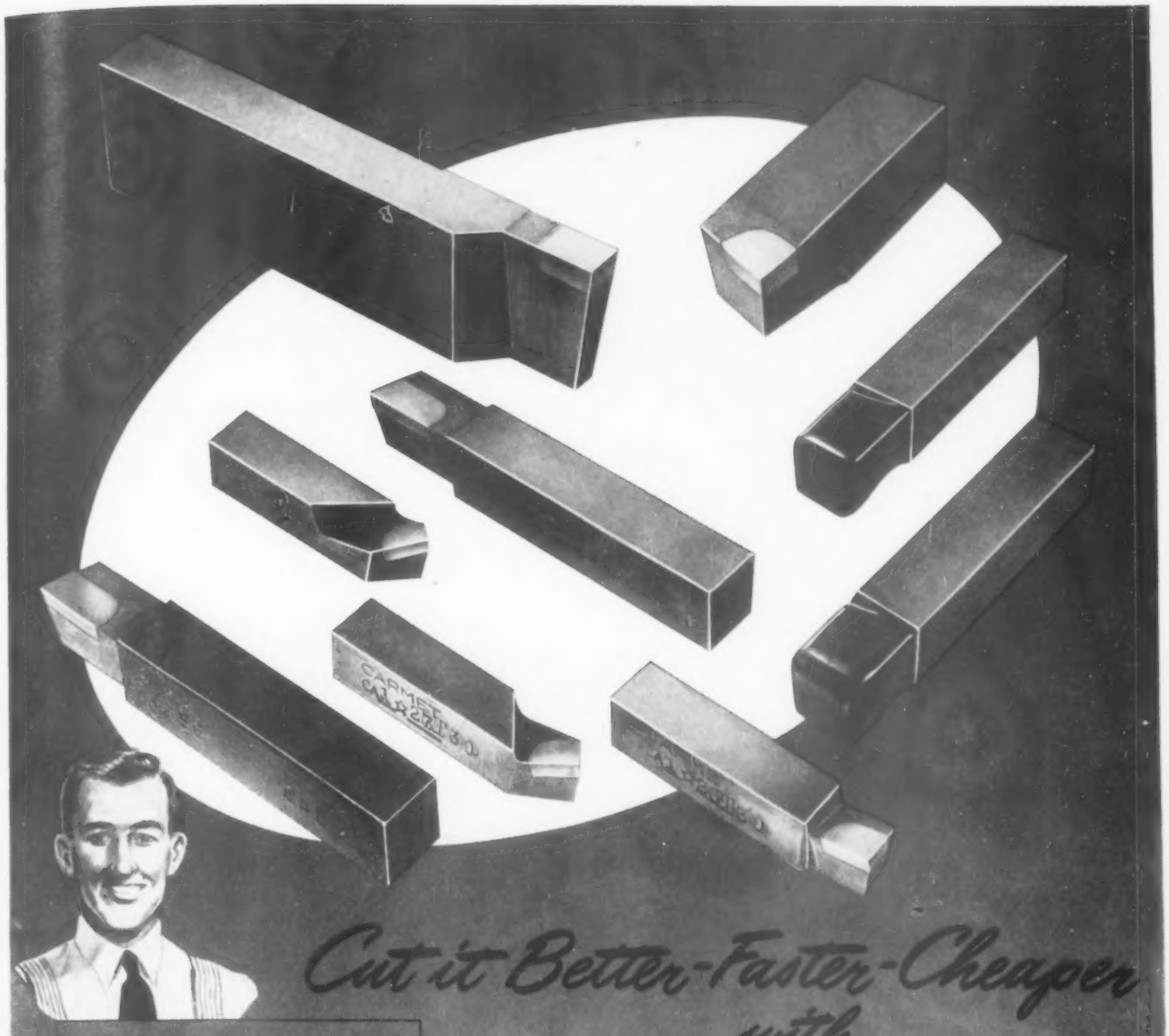

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CARMET

Carbide Tools

What other jobs have you for **CARMET** *to do*

We specialize in precision preforming of Carmet carbide metals to *any* shape for special wear-resistance needs, such as dies, gage blanks, etc. Let us quote on *your* requirements.

The Allegheny Ludlum line of Carmet Carbide Tools is *complete*—every style, size and grade you may need for any cutting job in the shop. If you make your own tools, a full line of blanks is available, too—as well as all necessary sizes of A-L Shank Steel. Extensive stocks of Carmet standard tools and blanks are carried in A-L and Distributor's warehouses coast to coast, and special tools are available to order. ● Just remember, for best performance on any application, *use Carmet!*

Allegheny Ludlum Steel Corporation

CARBIDE ALLOYS DIVISION, Detroit 20, Michigan

W&D 813

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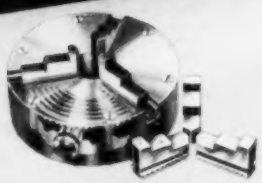
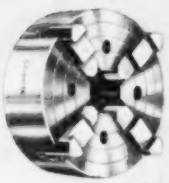
A WORLD STANDARD FOR PRECISION

No matter what your Work Holding Problem . . .
consult
CUSHMAN

Light Duty

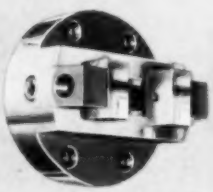


3 JAW
SELF-CENTERING



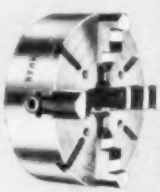
4 JAW
INDEPENDENT

Medium Duty



2 JAW
SELF-CENTERING

3 JAW
SELF-CENTERING

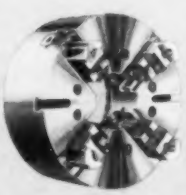


4 JAW
INDEPENDENT

Heavy Duty

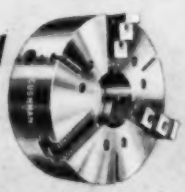
2 JAW
SELF-CENTERING

3 JAW
SELF-CENTERING



4 JAW
INDEPENDENT

Extra Heavy Duty



3 JAW
SELF-CENTERING

4 JAW
INDEPENDENT

Cushman Chucks are now being made in a wide range of types, sizes and jaw specifications for mounting on American Standard Type A-1, Cam-lock Type D-1 and Long Taper Key Drive Spindle noses, as well as for use on threaded spindles, using adapter plates. The right chuck with the right jaw equipment can help you reduce machining costs. Consult us.

THE CUSHMAN CHUCK COMPANY
HARTFORD 2, CONN.

Comprehensive Series of
CUSHMAN POWER CHUCKS
and
AIR CYLINDERS
are now available.
Write for Catalog PO63 and Bulletins

Consult
CUSHMAN

Chucking Engineers Since 1862

Pacific Coast Plant Betters Production of Hot Water Tanks with FARQUHAR HYDRAULIC PRESS

NO production time has been lost for maintenance purposes since the day this 500-ton Farquhar metal-forming press was installed at the Seidelhuber Iron & Bronze Works, Seattle, Washington.

The Farquhar Press is used for forming heads for hot water storage tanks. Better production is obtained because there has been no machine "down-time" with the Farquhar Press on the job. Smoother operation and improved quality are obtained because Farquhar's hydraulic cushion eliminates wrinkling and tearing.

The Seidelhuber plant is only one of hundreds of users throughout industry who depend on Farquhar Hydraulic Presses for better production. In the shop or on the line, you get the benefits that Farquhar builds into every press: (1) Rapid advance and return of ram *for faster work*. (2) Extra length guides on moving platen *for greater accuracy*. (3) Finger-tip controls *for easy, smooth operation*. (4) Positive control of speed and pressure on the die *for longer die life*. Farquhar builds hydraulic production presses in all sizes and capacities for all types of industry.

Farquhar engineers are ready and willing to help solve whatever production problem you may have, with a hydraulic press that will do your job faster, better and cheaper. Why don't you give them a call?

Farquhar Hydraulic Press, *forming heads for hot water tanks. Nine gauge steel blank material (30" x 30") is used; head is 26" diameter. Only one man needed to place material in press.*

Send for Catalog

Farquhar
HYDRAULIC PRESSES
for Bending - Forming - Forging - Straightening - Hobbing - Assembling
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Hydraulic Press Division
1519 Duke St., York, Pa.
Please send me a Farquhar Hydraulic Press catalog.

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Firm.....

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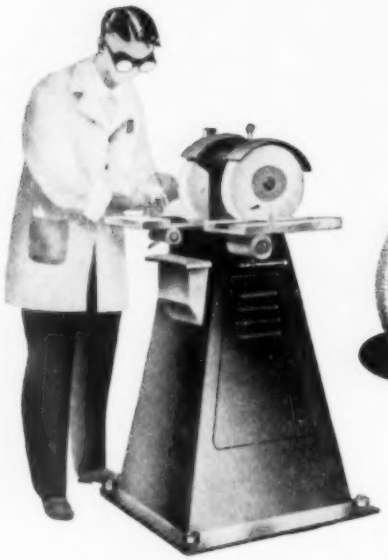
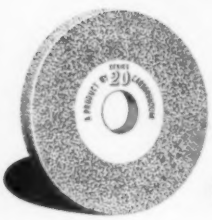
A BUYING GUIDE FOR ABRASIVES

ABRASIVE PROBLEM:
How can Selection and Application be simplified?





ANSWER BY
CARBORUNDUM
TRADE MARK

Through an extensive program, The Carborundum Company is making selection and application of the best abrasives to use for specific jobs simpler and more efficient. "Series 20" is a timely example. In a relatively narrow pattern of grits and grades, these wheels cover a wide range of grinding operations. The smaller number and variety of wheels that need be stocked is only one of several important benefits realized.

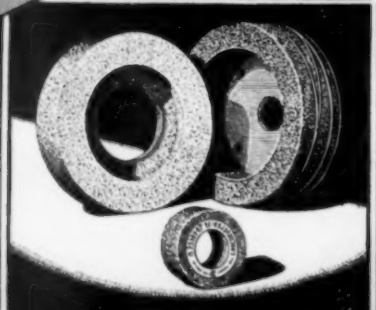
Easier to specify and order, products by CARBORUNDUM, repackaged and relabelled for fast identification, explain another reason for their growing preference by users of abrasive products. The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
TRADE MARK

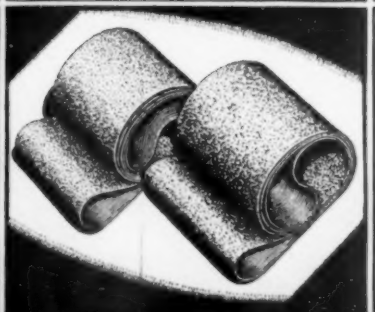
BONDED ABRASIVES
COATED ABRASIVES
ABRASIVE GRAINS AND
FINISHING COMPOUNDS

Specialized wheels by CARBORUNDUM for thread grinding

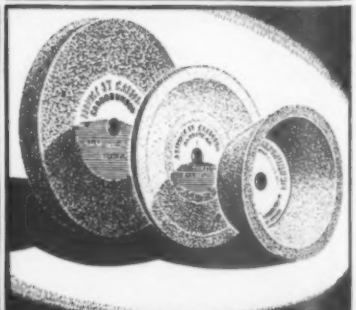
Diamond wheels to meet stiffer technical needs



Cool-cutting GREEN GRIT wheels for cemented carbide



A coated abrasive for every sanding and finishing condition



All standard shapes are supplied in grinding wheels by CARBORUNDUM

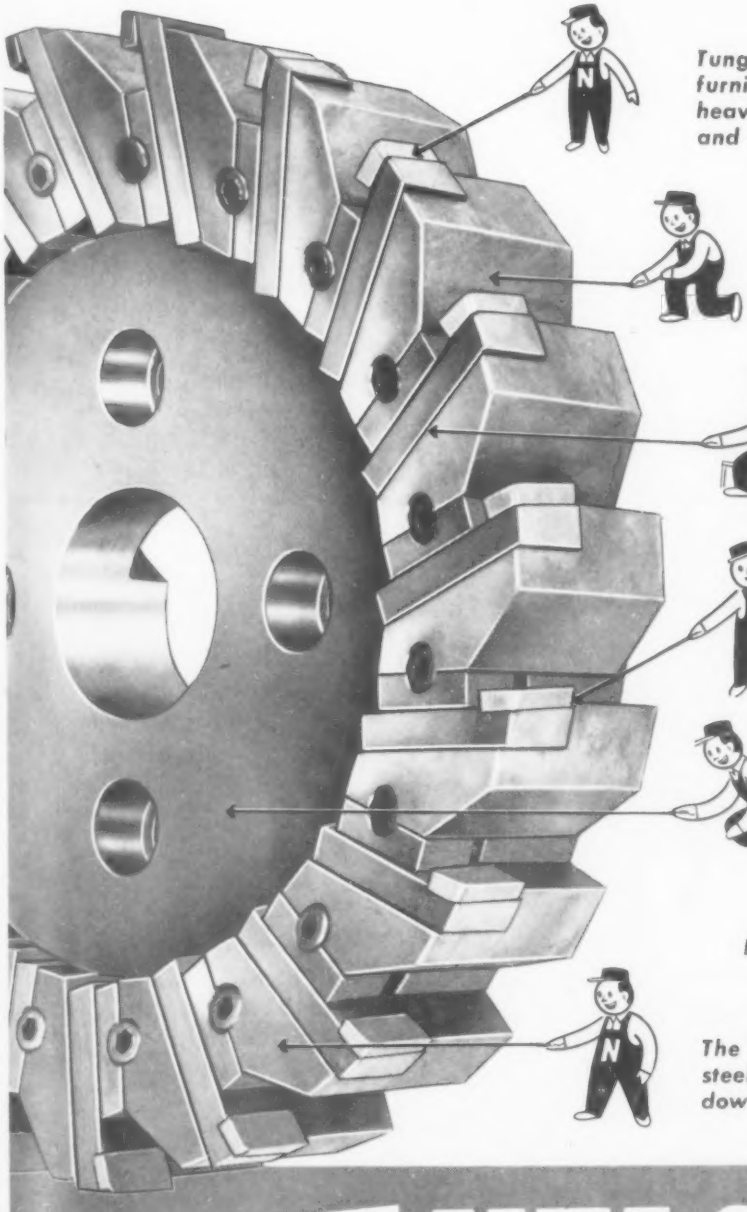
"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company.

for HIGHER PRODUCTION . . lower down-time

HERE'S THE NEW (Series IB)

NELCO *Face Mill*

. . . that has all these features. Together they mean higher production at lower cost.



1

Tungsten—carbide tipped inserted blades, furnished finish-ground. Easily inserted heavy tipped tools mean lower first cost and eliminate waste carbide.

2

Larger chip room prevents clogging.

3

Radially faced with cutting blades set on beveled bases for perfect two-way alignment before grinding.

4

Exceptionally fine pitch results in high table feed.

5

All steel body for extra ruggedness.

6

Heat-treated tool-steel wedges and blades.

7

The same cutter body for milling cast-iron, steel, aluminum, brass and bronze. Cuts down tool inventory.

Write for the name of your nearest Nelco dealer and descriptive literature including sizes and prices.

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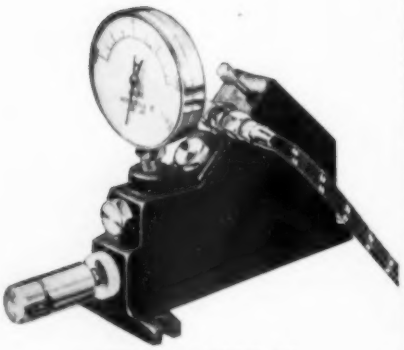
NELCO TOOL CO., INC., Manchester, Conn.

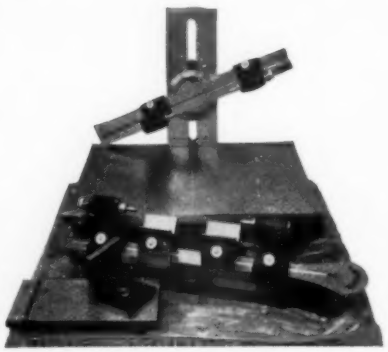
Look to Merz

for precision equipment for every inspection need!

EXACTITUDE
STANDARD A.G.D. GAGES



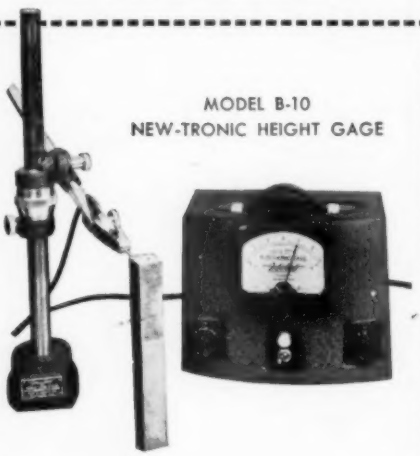
VERSATILE—MODEL 30
NEW-MATIC MEASURING MACHINE



MASTER MODEL
UNIVERSAL CHECKING PLATE

MODEL A
NEW-TRONIC
BALL SORTER

MODEL A-10
NEW-TRONIC
COMPARATOR



MODEL B-10
NEW-TRONIC HEIGHT GAGE

VIGILANT—MODEL 60
NEW-MATIC
MEASURING MACHINE

Whatever your inspection requirements, look with complete confidence to Merz precision measuring and checking machines. Every Merz product is a proved cost-cutter, a tested time-saver. The Merz line includes *New-Matic* Measuring Machines, *New-Tronic* Comparators and Gages, Checking Plates, Standard A.G.D. Gages. Merz also specializes in the custom-building of equipment for handling unusual inspection and sorting problems, however complex. Merz inspection equipment has for years been helping to reduce loss, speed production and increase profits for many of the nation's leading industries. Write for complete information on how Merz' "Four Spheres of Service" can do the same for you.

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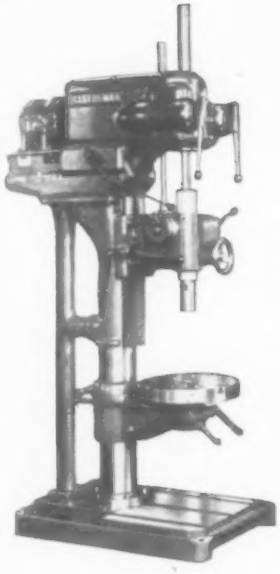
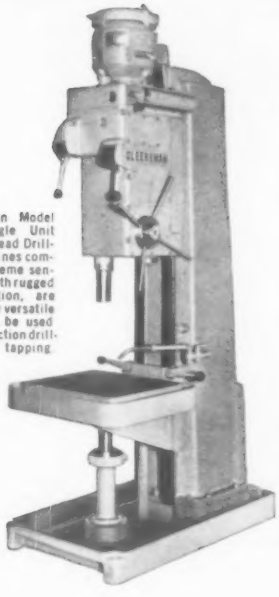
The House That Precision Built

THE CLEEREMAN LINE

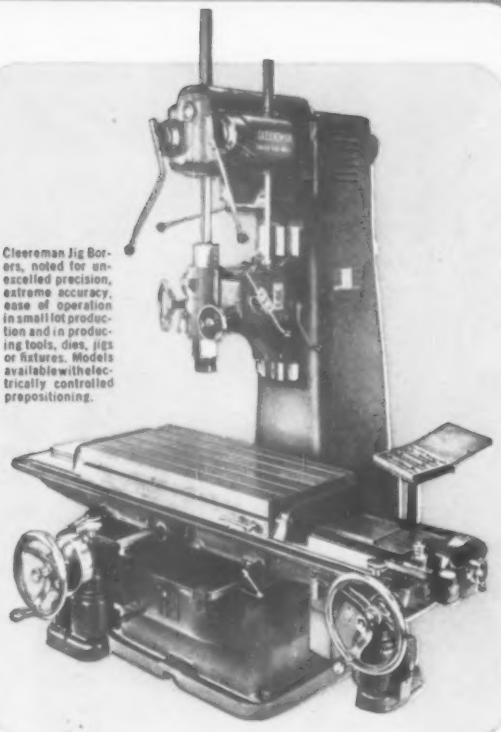
OF PRECISION JIG BORERS and DRILLING MACHINES



Cleereman Round Column Drilling Machines produce accurate holes at high speed and at low cost and are general purpose machines with high production.

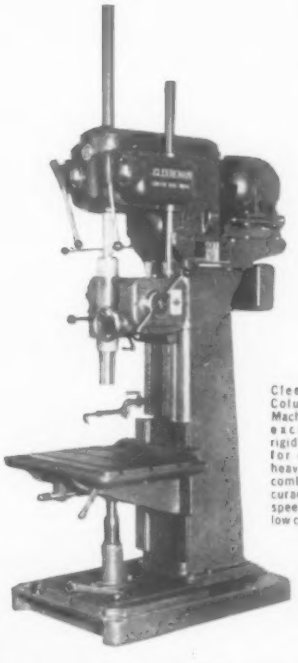


Cleereman Model 325 Single Unit Sliding Head Drilling Machines combine extreme sensitivity with rugged construction, are extremely versatile and may be used for production drilling and tapping.



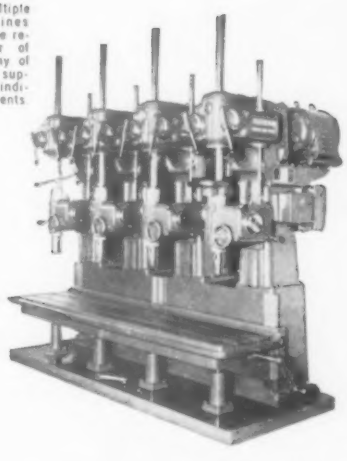
Cleereman Jig Borers, noted for unexcelled precision, extreme accuracy, ease of operation in small lot production and in producing tools, dies, jigs or fixtures. Models available with electrically controlled prepositioning.

for
Speed
Accuracy
Adaptability



Cleereman Box Column Drilling Machines have an exceptionally rigid construction for continuous heavy duty work combined with accuracy and the speed required for low cost production.

Cleereman Multiple Drilling Machines consisting of the required number of machines of any of the three types supplied to meet individual requirements.



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BUILDERS OF PRECISION JIG BORERS & DRILLING MACHINES

FIRTHITE SINTERED CARBIDE,

used in your shop tooling brings

—more rapid removal of material
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—better finishes
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—holding of closer tolerances
—longer tool and die life
. . . all of which adds up to higher production at lower costs

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This new catalog, just off the press, contains information on the most recent developments in Firthite carbides and describes forms supplied and grades available for cutting tools, special tools and wear parts.

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4

SUNNEN HONING

Saves Time...

Steps Up Production of Shift Forks...

at Spicer Mfg. Div. of Dana Corp., Toledo, Ohio

Areas on these parts are induction hardened — and the hardening creates high spots and distortion which must be removed.

Surfaces are too hard to ream or to broach, but Spicer engineers found the answer when they turned to Sunnen Honing. Sunnen honing stones removed the metal quickly and at much lower cost than by any other method.

Even on parts with slotted diameters, Sunnen Honing produces straight, round holes — with fast rate of stock removal.

Here are other reasons why hundreds of industrial plants are using Sunnen Precision Honing Machines —

- **Wide Range—hones diameters from .120″ to 2.625″. Open or blind holes and bores with keyways**
- **Hones All Metals, Ceramics, Glass — steel, cast iron, bronze, brass, aluminum**
- **Accuracy Within .0001″ Guaranteed — corrects out-of-roundness and distortion. Produces straight, round holes**
- **Produces Any Micro-inch Finish Required — no high spots or chatter marks.**

Write for bulletin XSP-5 or, on request, a Sunnen engineer will be glad to show you the advantages of using Sunnen Honing in your plant.

-381

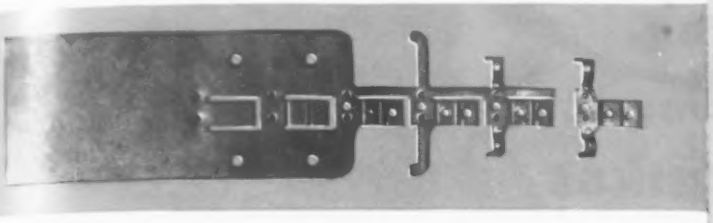
SUNNEN PRODUCTS CO. 7947 Manchester Ave., St. Louis 17, Mo.

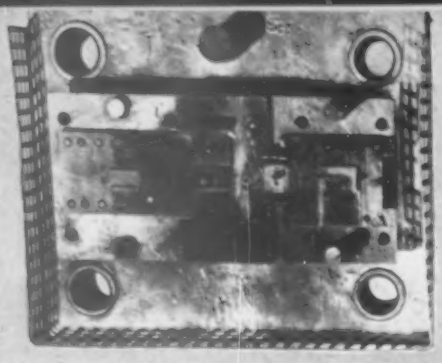
Canadian Factory: Chatham, Ontario

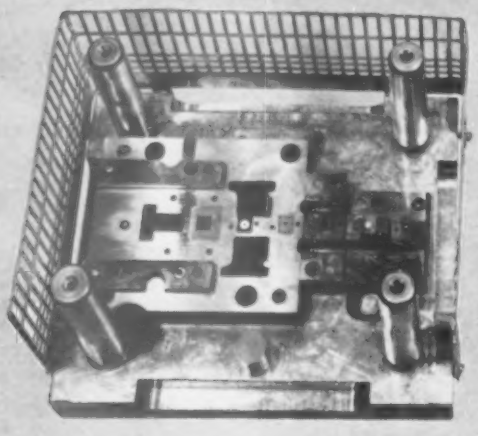
SUNNEN HONING

"Low-cost production of precision holes"

Averages 122,500 Pieces per grind







...using DANLY Precision Die Set

6-station progressive die setup speeds production of complex brackets

save time | **USE DANLY NATION-WIDE DIE SET ASSEMBLY SERVICE**

Assembly plants (marked with stars) stock interchangeable parts for quick assembly and delivery of any standard die set to your specifications.

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- ★ **Cleveland 14,** 1550 E. 33rd St.
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- ★ **Grand Rapids,** 113 Michigan St., N.W.
- ★ **Long Island City 1,** 47-28 37th St.
- ★ **Los Angeles 54,** Ducommun Metals & Supply Co., 4890 S. Alameda
- • **Milwaukee 2,** 111 E. Wisconsin Ave.
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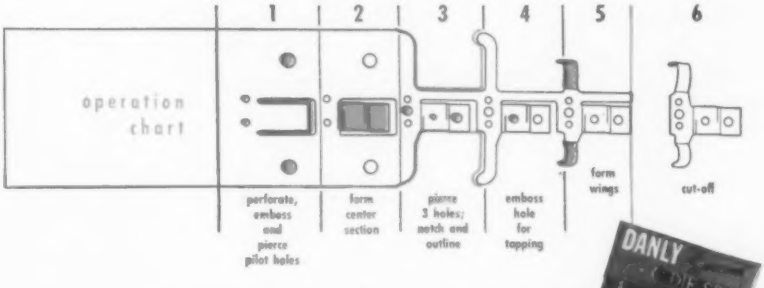
Helpful engineering service will be rendered gladly without obligation. Call on the convenient Danly branch office nearest you. Whether you require close precision or the maintenance of ordinary tolerances, you will find there is a Danly Die Set available to suit your needs in any size, standard or special, for any type of press operation.

The profitable application of progressive dies as a means to speed production and cut stamping costs is illustrated by this die setup. Operating costs are held to a minimum by the maintenance of close punch and die relationship. On a run of over 735 thousand mounting brackets, an average of 122,500 pieces has been obtained per grind. To assure accurate setups and precision operating results, a Danly 4-post precision steel die set is used.

Tolerance of ± .003″ held on hole centers

The bracket is produced from 2½″ by .042″ AISI-1008 steel strip at a rate of 7152 pieces per hour. A tolerance of ± .003″ is held between the center lines of the two pierced holes and the one embossed hole. The hole sizes are held to ± .005″.



Write for this *free* bulletin

Illustrates how you can use Danly's machining service to save additional time and money on special die sets.

DANLY

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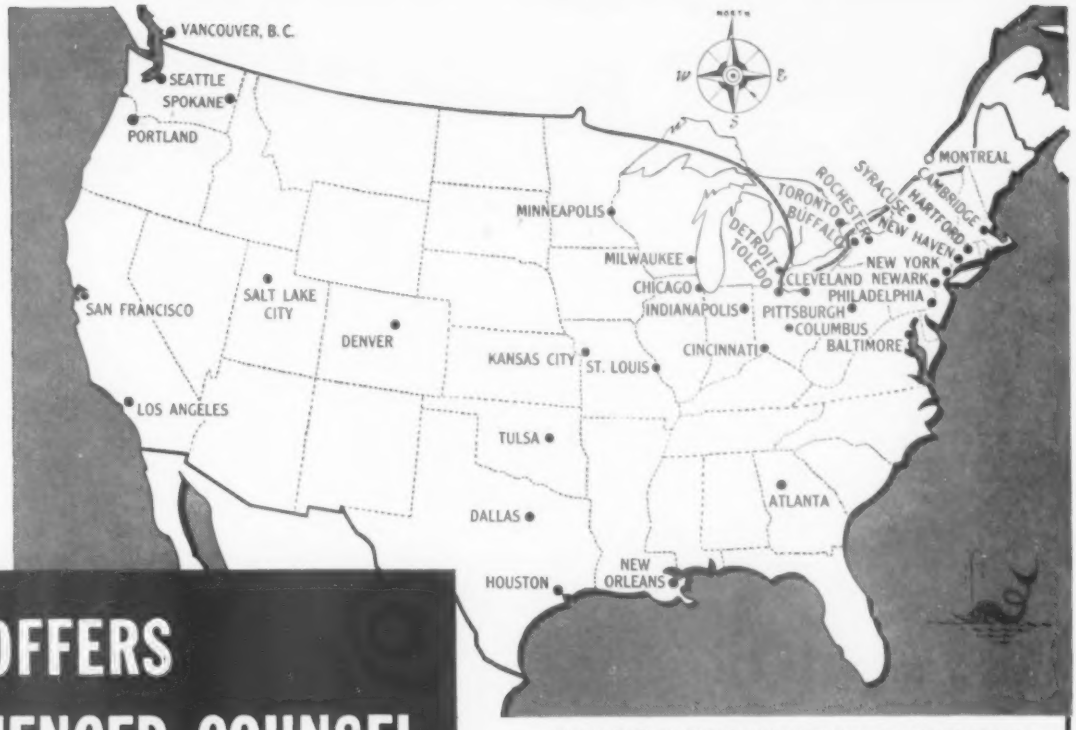
2100 SOUTH 52ND AVENUE, CHICAGO 50, ILLINOIS

25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

PRECISION DIE SETS...STANDARD AND SPECIAL • MECHANICAL PRESSES AND PRESS EQUIPMENT



INCO OFFERS EXPERIENCED COUNSEL ON METAL PROBLEMS

Avail yourself of experienced counsel on problems relating to the properties, treatment, fabrication or performance of ferrous and non-ferrous metals containing nickel.

We offer consultation . . . and invite you to write, wire or phone the INCO Technical Field Section or Stock and Service Center nearest to your plant.

"INCO" TECHNICAL SECTIONS

Consultation on technical problems relating to alloys containing nickel is invited. Consult the nearest Technical Field Section of INCO Development and Research Division listed below:

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Tel. Elgin 7471

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New York 5, N. Y.
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CHICAGO SECTION
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Tel. Franklin 4030

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Carew Tower,
Cincinnati 2, Ohio
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DETROIT SECTION
General Motors Building,
Detroit 2, Mich.
Tel. Madison 3436

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The following are sources of supply for primary nickel for alloying purposes. Through casting specialists, they are prepared to offer technical service on the production of ferrous and non-ferrous castings containing nickel.

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413 West North Avenue
Tel. Lafayette 2300

BUFFALO 2
Whitehead Metal Products Company, Inc.
254 Court Street
Tel. Cleveland 1475

CAMBRIDGE 39, MASS.
Whitehead Metal Products Company, Inc.
281 Albany Street
Tel. Trowbridge 6-4680

CHICAGO 23
Steel Sales Corporation
3348 South Pulaski Road
Tel. Bishop 7700

CINCINNATI 14
Williams and Company, Inc.
1921 Dunlap Street
Tel. Cherry 4700

CLEVELAND 14
Williams and Company, Inc.
3700 Perkins Avenue
Tel. Express 7000

COLUMBUS 15, OHIO
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Tel. Dixon 4-3925

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Pacific Metals Company, Ltd.
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Winter Chip Driver Taps are designed for fast operation in tough alloys. They are part of Winter's complete line of carbon and high speed steel taps and dies.

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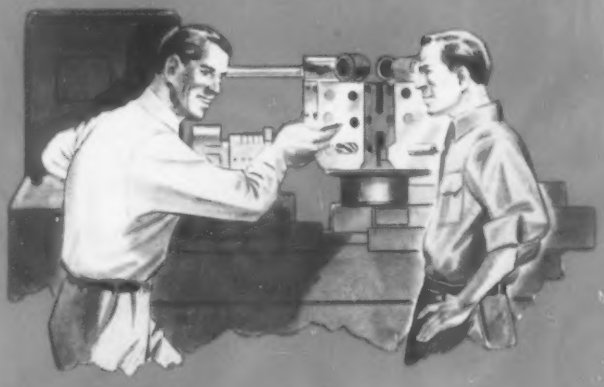
WINTER

PERFORMANCE IS BUILT INTO NATIONAL METAL CUTTING TOOLS

FIELD ENGINEERING SERVICE



National Heavy Duty Milling Cutters are designed for heavy cuts where a substantial amount of stock must be removed. Other National metal cutting tools include twist drills, reamers, counterbores, end mills, and hobs.

Long and productive tool life depends as much on the way tools are used as on their quality and design. To help users get the most out of their metal cutting tools, National maintains a complete field engineering service. National engineers have the wide experience of the entire National organization to call on. You are invited to call on your National field engineer the next time you run into a troublesome metal cutting problem.

Call Your Distributor

LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL Cutting Tools. Call them for cutting tools or any other staple industrial product.

NATIONAL TWIST DRILL AND TOOL COMPANY

ROCHESTER, MICHIGAN, U. S. A. Tap and Die Division—Winter Bros. Co.

Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco

SPEED-UP YOUR PISTON PRODUCTION

New **HEALD** Bore-Matic finishes more than 1600 piston pin holes per shift from cast hole.

The production of aluminum-alloy pistons, like so many other automotive parts, calls for very high standards of precision. But that's not all; parts must be produced rapidly, with minimum effort and attention. The new Heald Bore-Matics meet *both* requirements.

For example, the two-station, end-operated Heald Model 221 Bore-Matic shown above, handles (at 70% efficiency) over 200 pistons an hour—or more than 1600 pistons in one 8-hour shift. Designed for automatic, two-way boring of pin holes in two pistons simultaneously from the rough casting, this machine holds tolerances of less than .0001 for roundness, and .0002 or .0003 for size as required, under average conditions of stock removal (.040-.060 on diameter).

Whatever *your* borizing operations, you'll find a Heald machine that can meet your precise requirements—for faster, easier, lower-cost production. For further information on the new Bore-Matics, get in touch with your nearest Heald representative, or better still, call on us here at Worcester.

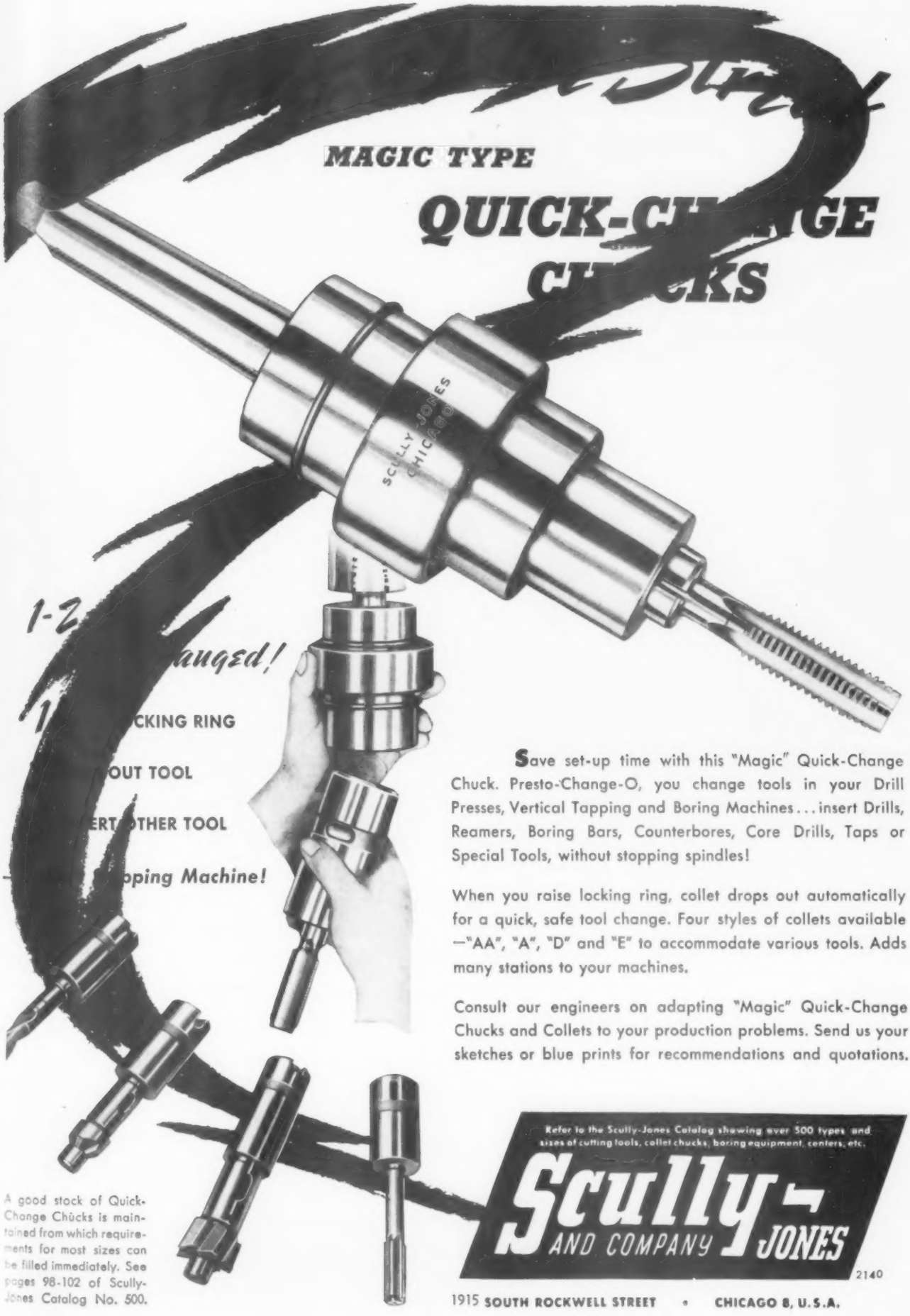
Are you ready for '49 production?

For the automotive industry, 1949 will be a year of challenge. For as production catches up with demand, there is more and more emphasis on cutting manufacturing costs, through the use of more efficient machine tools. These new machines are available now, to give you both increased production and greater precision, at lower cost. Heald engineers will be glad to discuss your specific problems.

THE HEALD MACHINE COMPANY, Worcester 6, Mass.

Branch Offices in Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New York

HEALD



Save set-up time with this "Magic" Quick-Change Chuck. Presto-Change-O, you change tools in your Drill Presses, Vertical Tapping and Boring Machines . . . insert Drills, Reamers, Boring Bars, Counterbores, Core Drills, Taps or Special Tools, without stopping spindles!

When you raise locking ring, collet drops out automatically for a quick, safe tool change. Four styles of collets available —"AA", "A", "D" and "E" to accommodate various tools. Adds many stations to your machines.

Consult our engineers on adapting "Magic" Quick-Change Chucks and Collets to your production problems. Send us your sketches or blue prints for recommendations and quotations.

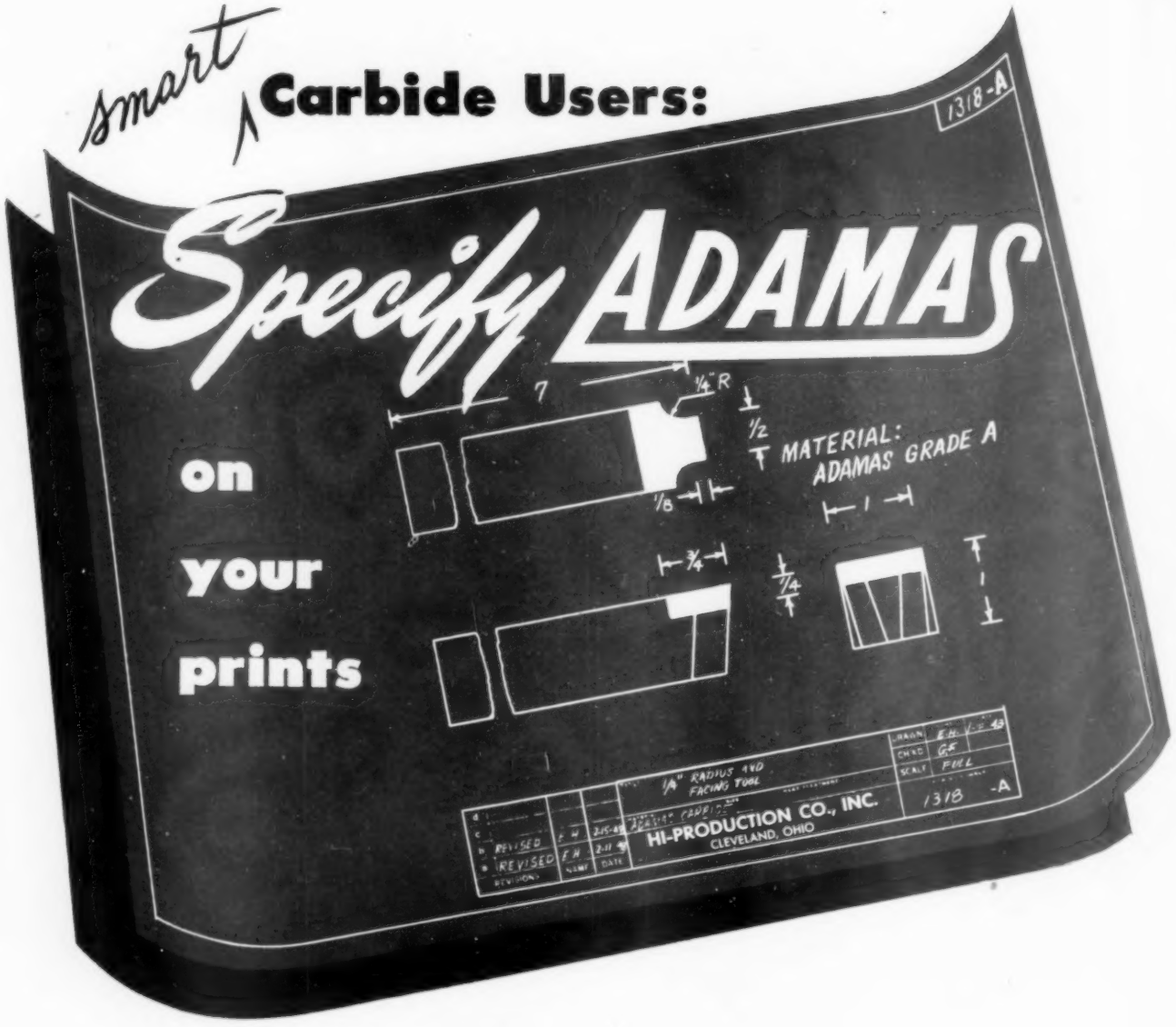
A good stock of Quick-Change Chucks is maintained from which requirements for most sizes can be filled immediately. See pages 98-102 of Scully-Jones Catalog No. 500.

Refer to the Scully-Jones Catalog showing over 500 types and sizes of cutting tools, collet chucks, boring equipment, centers, etc.

Scully-Jones AND COMPANY

2140

1915 SOUTH ROCKWELL STREET • CHICAGO 8, U.S.A.



ADAMAS CARBIDE
specified on your blueprints assures you:

- ✓ *Increased speeds and feeds*
- ✓ *Closer tolerance limits*
- ✓ *More pieces between grinds*
- ✓ *Decreased down time*

...because
ADAMAS MEANS QUALITY
in tungsten carbide

An increasing number of high production metal working plants are taking the advice of their carbide toolmakers and specifying "Adamas Carbide" on their blueprints. High Rockwell hardness combined with maximum transverse rupture strength and unvarying uniformity is convincing proof of Adamas quality. Specify "Adamas Carbide" on your next print —check performance for yourself.

Adamas carbide blanks available in all standard styles and grades—shipped same day your order received. Special preformed tool tips and wear parts — delivery averaging under one week.

The revised Adamas "Comparison Chart of Cemented Carbide Grades" will aid you in selecting the proper tungsten carbide for your job. Write Dept. E for your free copy.

ADAMAS CARBIDE CORPORATION
40-30 23rd STREET, LONG ISLAND CITY, NEW YORK
Producers of top quality carbide for cutting tools, dies and wear resistance—both standard and special

e size of blade only for both types F-Con-O-Mills of all diameters. ailable for steel, for cast iron, d for non-ferrous materials.

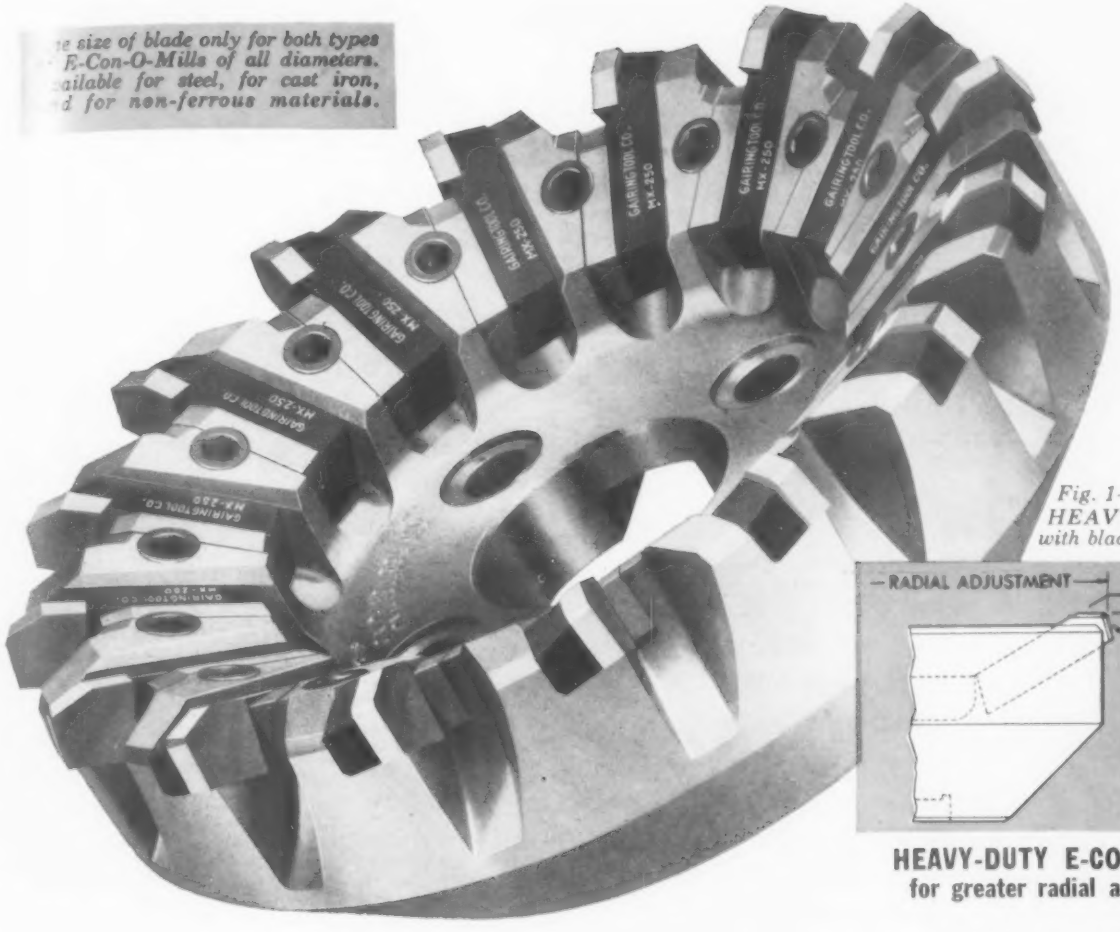


Fig. 1—10-inch HEAVY-DUTY with blades for cast iron

HEAVY-DUTY E-CON-O-MILL
for greater radial adjustment

Now . . . the Gairing **HEAVY-DUTY**

E-CON-O-MILL

IN SIZES 8-IN. DIA AND OVER

PATENT APPLIED FOR

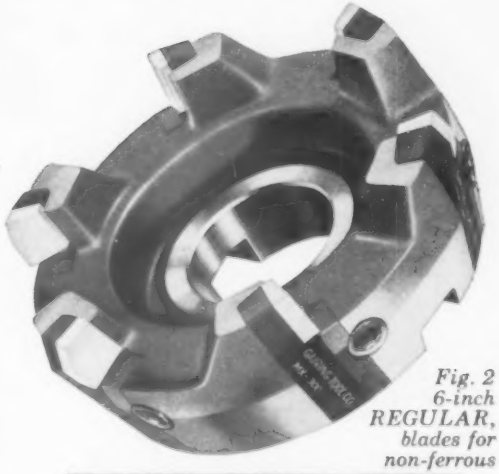
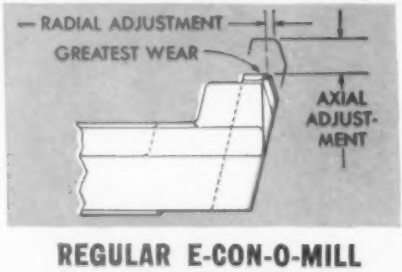


Fig. 2 6-inch REGULAR, blades for non-ferrous



REGULAR E-CON-O-MILL
for greater axial adjustment

This new standard face mill is offered for heavy roughing operations where the blades suffer more wear along the periphery than across the face of the cutter. It offers all the economies of the regular E-Con-O-Mill plus longer blade life while roughing.

The same blades and locks are used in both the heavy-duty and the regular cone-type bodies of all sizes, a further reduction in tool inventory.

These are the same blades that come finish ground, ready for work, and which may be replaced and re-sharpened without removing the cutter from the spindle; the same locks which remain entirely attached to the body when changing blades.

For a heavy-duty face mill at its best, call your Gairing representative or write to us.

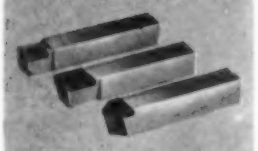
THE GAIRING TOOL COMPANY

21223 Hoover Road, Detroit, Michigan

1 POUND to 1000 POUNDS

Talide
(TUNGSTEN CARBIDE)
Work Rolls

TALIDE METAL MEETS EVERY REQUIREMENT

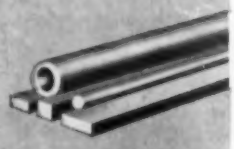


CUTTING TOOLS

DRAWING DIES

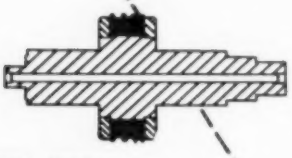
CENTERLESS BLADES

DRILL JIG BUSHINGS



SOLID BAR STOCK

FOR FLAT WIRE



FOR SHAPE WIRE

FOR STRIP

Used for rolling all kinds of steel, non-ferrous metals, flat and shape wire.

25 to 50
times more work per grind

This solid tungsten carbide (Talide Metal) roll is the largest product ever made of tungsten carbide. Solid or sleeved, carbide rolls are an exclusive development of Metal Carbides Corporation . . . diameters up to 10" and lengths up to 40". Much harder than the hardest steel rolls, carbide rolls take and impart a mirror-like finish to the metal rolled. On production, mills report 25 to 50 times more service life per grind.

OTHER ADVANTAGES INCLUDE:

MORE PRODUCTION	CLOSER TOLERANCES
HIGHER SPEEDS	GREATER REDUCTIONS
LESS DOWN TIME	FEWER REJECTS

Carbide rolls can be reground twice as many times as steel rolls. Improved physical properties of the strip reduce cost of subsequent plating and stamping operations.

Send for Circular on TALIDE ROLLS

SINTERED CARBIDES
MC TALIDE
HOT PRESSED CARBIDES

METAL CARBIDES CORPORATION

YOUNGSTOWN 5, OHIO *Pioneers in Tungsten Carbide Metallurgy*

CUTTING TOOLS . DRAWING DIES . WEAR RESISTANT PARTS

NEW SIMOMETER

gives you accurate **TESTED TENSION** in less than 1 minute per blade

Here's how SIMONDS Quick and Easy Tensioning Method gives you LONGER BLADE LIFE!

Avoid Undertension which causes crooked cutting, spoiled work, lost time.

Avoid Overtension which causes blade-vibration, rapid dulling of teeth, frequent blade-breakage.

Slip the *Simometer* Directly over Blade, tighten two thumbscrews . . . now put tension on blade until **Simometer** needle moves into green zone . . . and you *can see at a glance* you have the right tension on the blade.

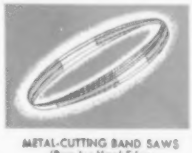
Then You're Set to get Faster, Straighter Cuts... and more cuts per blade . . . *the full measure* of performance which **SIMONDS** "Red End" Power Blades are made to give you. Ask your distributor.

BRANCH OFFICES: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 311 S. W. First Avenue, Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Washington. *Canadian Factory:* 595 St. Remi St., Montreal 30, Que.

SIMONDS ALSO MAKES:


FLAT GROUND STEEL STOCK (Oil Hardening)


"RED TANG" FILES


METAL-CUTTING BAND SAWS (Regular Hard Edge, Skip-Tooth, Spring Temper)


CIRCULAR METAL-CUTTING SAWS (Inserted-Tooth, Segmental, Solid-Tooth)

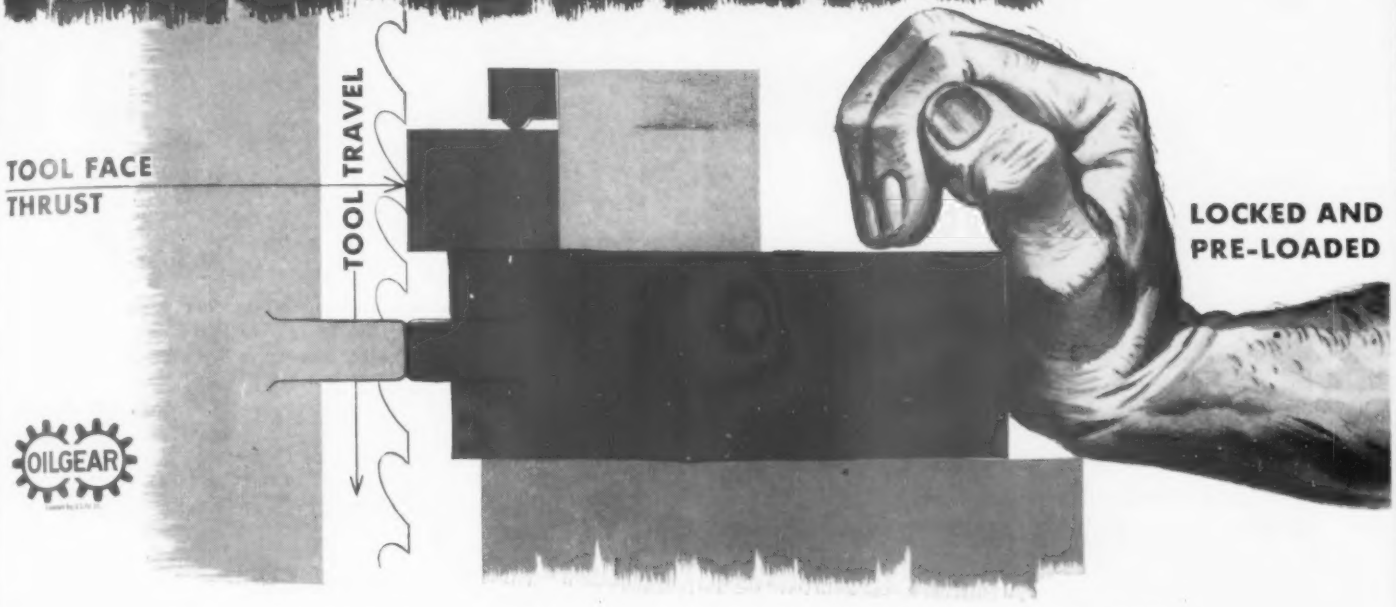
SIMONDS SAW AND STEEL CO.
FITCHBURG, MASS.
Other Divisions of SIMONDS SAW AND STEEL CO. making Quality Products for Industry

SIMONDS — Special Electric Furnace Steels
SIMONDS ABRASIVE CO. — Grinding Wheels and Grains
SIMONDS — Simonds Products for Canada

SIMONDS "Red End" HACKSAW BLADES

WHEN YOU USE SIMONDS YOU STAY IN THE HIGHLANDS . . . OF CONSISTENT CUTTING EFFICIENCY

k Tables



If your broached parts are not being finished to consistently close tolerances and flat surfaces, it is evident that the table operating and holding mechanisms on your broaching machines are yielding to tool face angular thrusts. It is equally obvious that *NO* table which is *NOT* pre-loaded and thus rigidly held in broaching position can withstand these forces without deflection.

This is a broaching problem which Oilgear has solved with its patented and exclusive work table shuttling mechanism which both *locks* and *pre-loads* the tables in broaching position. Under peak tonnage tool face thrust there is no measurable table deflection. Parts are held firmly in broaching position and do not yield to varying broaching tool forces. Consistently close tolerances and true flat surfaces are easily maintained.

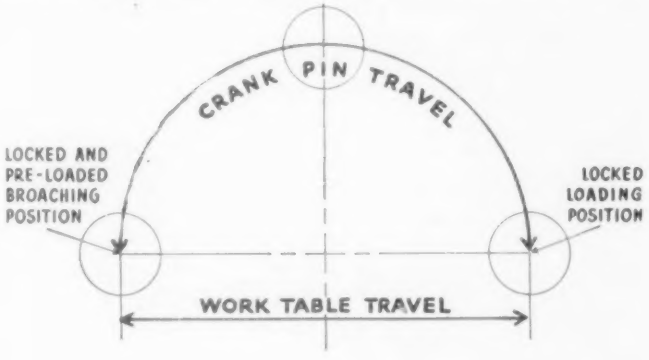
INTERLOCKED TABLE MOVEMENTS

Oilgear work table movements are *interlocked* hydraulically, electrically and, in the double slide machines, also mechanically, for positive sequence operation with tool slide. *No cycle malfunctioning is possible.* There are no valves to constantly adjust or maintain. There is no complicated switch arrangement to adjust or maintain. For the table interlock, Oilgear uses only one limit switch, only *one* relay.

HARMONIC TABLE MOTION

Oilgear's fluid power, direct ram-actuated, heavy-duty crank mechanism shuttles work table to and from broaching position at controlled high speed. Cushioned, 180° harmonic motion of crank eliminates starting and stopping shocks and positively locks table under pre-load in broaching position. Parts do not have to be clamped before table moves. Automatic clamping and unclamping of work is easily applied.

DIAGRAM ILLUSTRATING
HIGH-SPEED HARMONIC TABLE MOTION



OTHER FEATURES

These and other features such as long table travel for straddle broaching, hardened and ground ways with adjustable gibs which prevent tilting and automatic pressure lubrication to vital points also contribute to the outstanding performance of Oilgear Surface Broaching Machines. Write for descriptive bulletins. THE OILGEAR COMPANY, 1308 W. Bruce Street, Milwaukee 4, Wis.

Oilgear Fluid Power

The Birth of Precision

12 HAIRBREADTHS = 1 POPPY SEED
4 POPPY SEEDS = 1 BARLEY CORN
3 BARLEY CORNS, END TO END = 1 INCH
(First used in England, early 16th Century)

Out of a single poppy seed, a 16th Century device first used in England to measure 12 hairbreadths, came man's quest for accuracy of measurement. It was the birth of precision.

Down through the centuries, man has learned the importance and economic value of accuracy. It is imperative in industry and in the fabrication of all materials.

In highway construction, oil fields, on the farm, in the building trades, in the shops of industry . . . at sea, on the rails and in the air . . . in forests, mines and mills, in homes and stores, in class rooms . . . measuring instruments are essential, indispensable to good workmanship and fine quality. The tape, the rule, the precision tool are instruments of accuracy. Their dependability is governed by the inviolate standards of the men who make them. Lufkin's unending search for ever-finer quality is reflected in products of longer life, greater accuracy and exclusive features which aid today's skilled craftsmen in their all-important work.

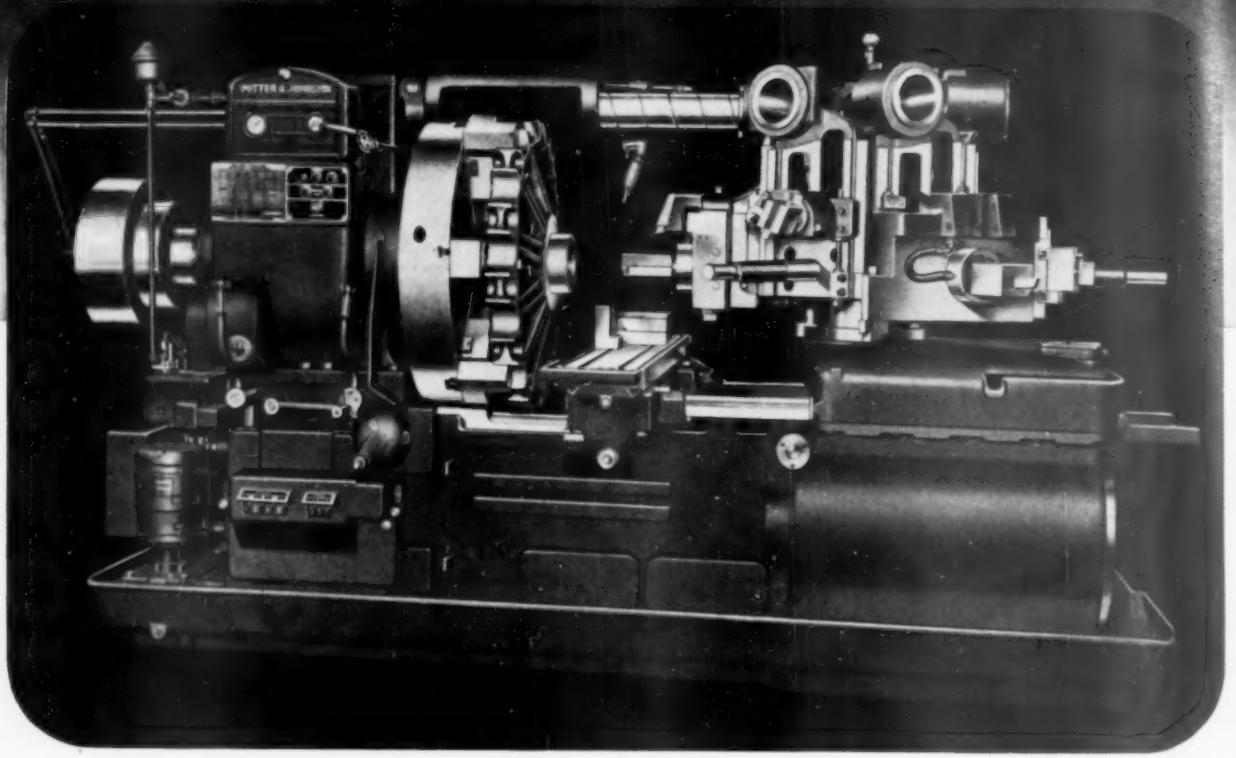
For 65 years Lufkin has dedicated its resources and facilities to the production of better measuring instruments. Wherever precision is a creed . . . wherever man seeks the truth in dimensions the name of Lufkin is recognized as a symbol of undeniable accuracy—a tribute to precision.

PRECISION TOOLS **LUFKIN** TAPES • RULES

Accuracy of Measurement is the Key to Precision

THE LUFKIN RULE COMPANY • SAGINAW, MICHIGAN

6-DS



1. *Great Flexibility and Production Capacity*
2. *4 Automatic Changes of Spindle Speed*
3. *3 Selective Automatic Changes of Feed*
4. *Automatic Binding of the Turret Following Index*
5. *Direct Cross Slide Action*
6. *Motor Driven Constant Rapid Traverse Motion to Cross Slide and Turret*
7. *Great Power and Rigidity*
8. *Permanency of Alignment, Freedom from Scoring and Long Life.*

Other special features on the 6-DS AUTOMATIC TURRET LATHE are designed for three reasons: to increase production, to improve quality and to cut cost. The headstock unit, for instance, has a spindle made from high carbon steel forging, mounted on ball bearings. There are 20 changes of speed between 7 and 160 rpm. Speeds are arranged in five sets of four automatic changes. Any set of four automatic changes may be quickly obtained by application of proper set of hand pick-off gears. A special high speed model is available with a maximum spindle speed of 248 rpm. Speed and feed change clutches are operated automatically by dogs and hand control. Feeds are in three groups, coarse, medium and fine. You will want complete details on this profitable machine; so simply drop us a line and the information will be mailed promptly.

SPECIFICATIONS		
	6DS	6DSE
BED swing over	34"	40"
CROSS SLIDE swing over	21"	27"
CROSS SLIDE travel each way	8½"	8½"
TURRET no. of faces	6	6
TURRET slide travel	25"	25"

POTTER & JOHNSTON CO.
PAWTUCKET, RHODE ISLAND
Subsidiary of
PRATT & WHITNEY
Division Niles-Bement-Pond Company

Here's a Proved Short-Cut to Savings

5 Kennamatic tools in action, roughing a forged steel stem pinion, SAE 5140. Speed is 230 SFM, feed .027", depth of cut 3/16" . . . and the Kennamatic tools turn out 350 pieces per index, 56,000 pieces per tool!

When the going gets tough . . . . Kennametal Tooling is the sure way to faster production at less cost

Another typical example of time-saving Kennamatic tooling. This cast iron valve body is turned at 250 SFM, with a feed of .005", depth of cut from 1/8" to 3/16". On this job other brazed tools had to be changed 8 times per shift . . . whereas Kennamatic inserts are simply indexed twice per shift, and give four days' service before resharpening.

Why wait for the going to get tough?

Under the pressure of rising costs—it becomes "tougher" and "tougher" to produce at a profit, and sell at a price.

But remember that "tough" is a relative term—any job is tough if there's an easier, faster, less expensive way to do it.

Your machining operations are tough, slow, and expensive . . . unless you are using uniformly strong, hard, long-lived Kennametal coupled with the latest Kennametal improvements in carbide tool design.

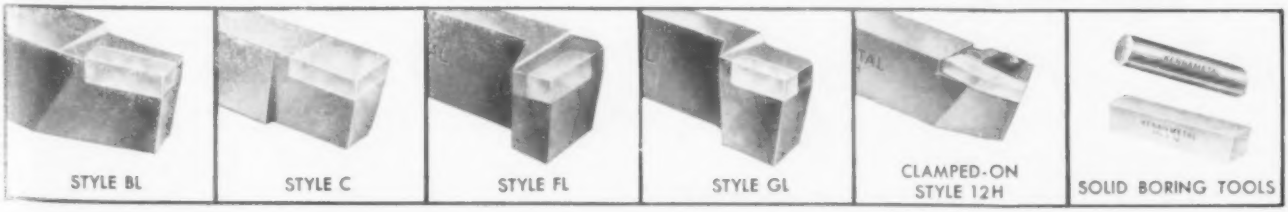
Kennametal tooling keeps your machines on the job with minimum interruption—enabling you to turn out from 2 to 5 times more than steel tools on the same machine in the same time, with from 5 to 20 times longer tool life.

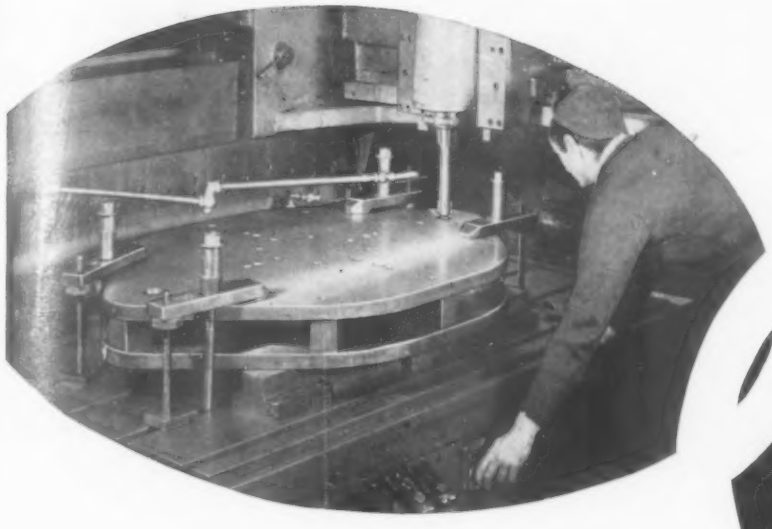
Use this modern tooling technique to save money in your plant—ask our district tool engineer to demonstrate.

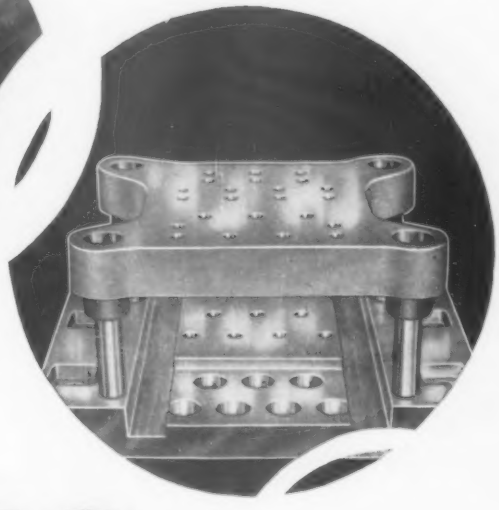
Write for new Catalog 48.

KENNAMETAL Inc. Latrobe, Pa.

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTION







A TIE UP TO SPEED UP
"Near Neighbor" Service

PRODUCTO
DIE SETS

The three links that tie together the factors you need to obtain Special Die Sets are Plant, Product and Service.

So let's look at the Producto record.

From foundry to finish your "Special" moves smoothly thru a cycle, every step of which employs expert manpower working with the finest of modern machines . . . many of them Producto-designed.

The product itself is the highest development of precise skills . . . both in design and finish . . . proven for many years under critical and demanding conditions.

But the Plus feature . . . Producto "Near Neighbor Service" is unexcelled in its field. It is your assurance of correct interpretation of your needs and fast delivery.

We prove these facts when you "specify Producto."

"Near Neighbor"
SERVICE

ATLANTA Main 4451
BALTIMORE Plaza 0340
BIRMINGHAM 54-9521
BUFFALO Cleveland 1110
CAMDEN, N. J. 4-7765
CHICAGO Central 6680
CLEVELAND Superior 6159
DAYTON Madison 5361
DETROIT Walnut 1-3101
ELMIRA 5168
ERIE 5-4375
GREENSBORO, N. C. 2-0608
INDIANAPOLIS Franklin 3508
LOS ANGELES Trinity 9826
MIAMI 3-2384
MONTREAL MA 5346
NEW YORK Worth 4-7484
PHILADELPHIA Lombard 3-1256
PITTSBURGH Atlantic 4116
ROCHESTER Main 5249
ST. LOUIS Jefferson 4805
SAN FRANCISCO Exbrook 2-2230
SYRACUSE 3-1181
TORONTO Hudson 9071
YORK, PA. 2042

THE PRODUCTO MACHINE COMPANY
990 HOUSATONIC AVE.
BRIDGEPORT 1, CONN.
TEL. 4-9481

Phone for "Near Neighbor" Service

13PD48

Speeds up to 500 surface feet per minute; Feeds up to 50 inches per minute

OK FREE-CUT carbide tipped face mills *"engineered for the job"* are designed for the new high horsepower, high-speed milling machines geared to meet today's need for *low-cost production.*

Series 3600 has the famous OK two-piece construction—*body* and *blades.* Tapered, wedge-shaped blades with mating serrations provide a combination lock that holds blades fast, straight and true under the most severe conditions. *No screws, pins, gibs or other locking devices are needed.* This simplicity plus more beef in the bodies adds the extra strength so necessary in modern high speed milling operations.

Performance records in the field over the past five years prove these FREE-CUT face mills capable of operating at speeds up to 575 surface feet and feeds up to 50 inches per minute on cast iron, with minimum horsepower consumption. They are supplied with **various combinations of positive and negative axial and radial rakes and lead angles,** depending on the machine, the material and design of the workpiece.

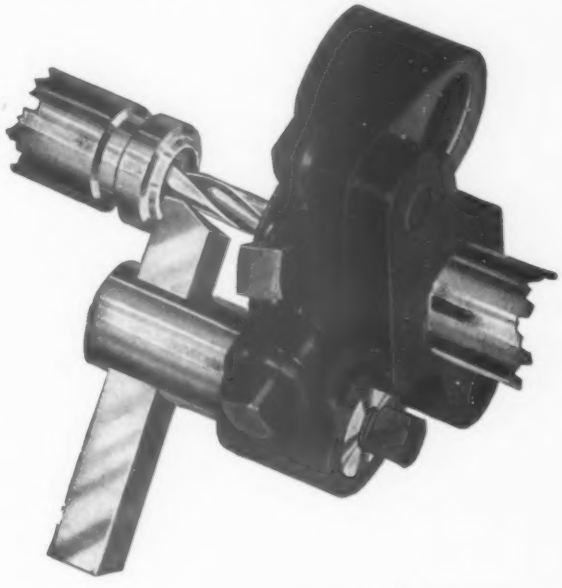
FACE MILLS: from 8 to 24 inch diameter. END MILLS and SHELL END MILLS: from 4 to 8 inch diameter.

Write today for new circular 36 on OK FREE-CUT *Face Mills.*

THE OK TOOL COMPANY, Inc.
Since 1901 SHELTON, CONNECTICUT

ON YOUR TURRET LATHES AND SCREW MACHINES

DOUBLE [MAKE TWICE AS MANY] PRODUCTION with R and L TOOLS . . .



Here's proof of R and L versatility: Turning and forming special shape on end of part while drilling or reaming

In enough cases to make the proverbial Scotchman jump for joy, R and L Tools actually enable shops to double the number of pieces produced per hour. We know that this statement will be open to question. We'd like you to question it and ask for proof because we know that once you saw the versatility of R and L Tools and their many, many possible applications, you'll want to use them whenever possible on all your machines. As a starter, we suggest you write us now for the idea-packed R and L Booklet which shows many R and L set-ups which are doubling production capacity in other shops throughout the country.

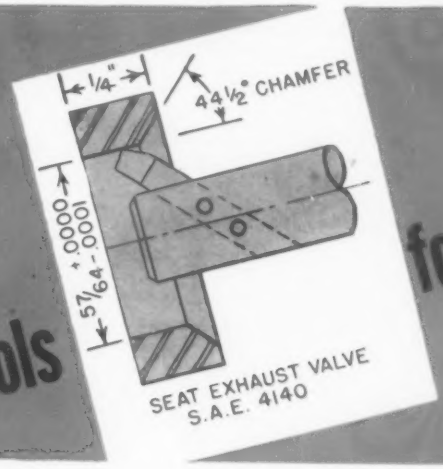
Production Records Always Tell the Wisdom of Tooling With R and L

R and L Tools

1825 BRISTOL STREET NICETOWN, PHILADELPHIA 40, PA.

New! R and L Back Rest Holders

Simple design allows for convenient interchanging of the R and L carbide surfaced backrest or roller backrest. Built in three sizes: 5/8", 3/4" and 1" diameter shank.



2 tools for the price of 1

...when V-R CARBIDE Is On The Job

The measure of carbide quality is in the performance. That's one reason why V-R Carbide tools give you consistent results where less tool cost and high production are key factors to profitable metal cutting operations.

Here's how ONE V-R Carbide tool outperformed all other carbides 2 to 1 on a standard boring operation.

Increasing costs reduced the profit on an exhaust valve seat boring operation to a point where a manufacturer decided to test various carbides in an effort to increase production and reduce tool costs and down time.

Testing various carbides on a four spindle boring machine simultaneously, other carbides produced 24 pieces before tool failure. V-R Carbide grade 2A7 produced 48 pieces when the test was stopped. Examination of the V-R Carbide tool showed only a slight trace of wear.

It was this switch from other carbides to V-R CARBIDE that provided another manufacturer with a sure margin of profit on a non-profitable boring operation.

test performance data

MATERIAL:	S. A. E. 4140 Rockwell 37C	
MACHINE:	Excello Four Spindle Boring Machine	
OPERATION:	Precision bore diameter 57/64". Width 1/4". Chamfer 44-1/2° angle.	
	V-R Carbide Grade 2A7	**Other Carbides**
S. F. M.	275	275
FEED PER REV.	.003	.003
DEPTH OF CUT	.045	.045
PIECES PER GRIND	48	24

● Why not check your carbide tool operations today for that extra margin at no extra cost! Call your nearest Vascoloy-Ramet Branch Office for V-R's experienced tool engineering service. For the best results try V-R Carbide or Tantung Cast Alloy tools and blanks NOW.

District Sales and Service in Principal Cities

V-R CARBIDE and TANTUNG

vascoloy-ramet corporation

WAUKEGAN • ILLINOIS

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WRITE FOR BULLETIN JD-101

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Tapping Attachments • Quick Change Collets and Chucks

Tap Performance is More Than a Tap—

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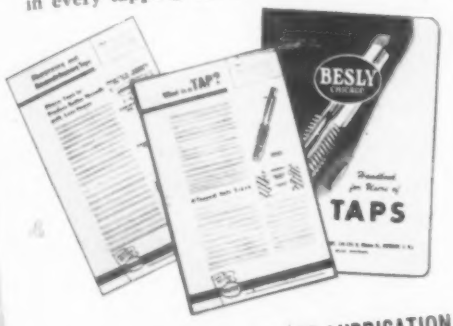
WHAT'S YOUR TAP PROBLEM?
Because tap performance *is* more than a tap you'll find Besly distributors well supplied at all times with information designed to help you achieve top efficiency in every tapping operation.



TAP SHARPENING
TAP LUBRICATION
TAPPING ALUMINUM, MONEL, PLASTICS
and many other tapping operations

Yes, it's the Besly "Helping Hand" that makes a Besly user specify Besly taps again and again. It's more than a tap for it's all this that he gets from Besly—

IT'S FASTER DELIVERY—with Besly's central location and fast handling of high speed specials (24 hours on hardened blank jobs; 3 weeks on bar stock specials).

IT'S TOP TAP QUALITY—delivered *consistently* on each repeat order.

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IT'S COOPERATION—Alert and intelligent, the sort that busy production men need and welcome.

The Besly user gets *all* these plus values because they are all part of the Besly "Helping Hand"—service that you can put to work for you *now* to give your product better threading at lowest possible cost per tapped hole.

Besly's "Helping Hand" Has 5 Strong Fingers

- Fast Delivery
- Top Tap Quality
- Engineering Counsel
- Qualified Distributors
- A Complete Line

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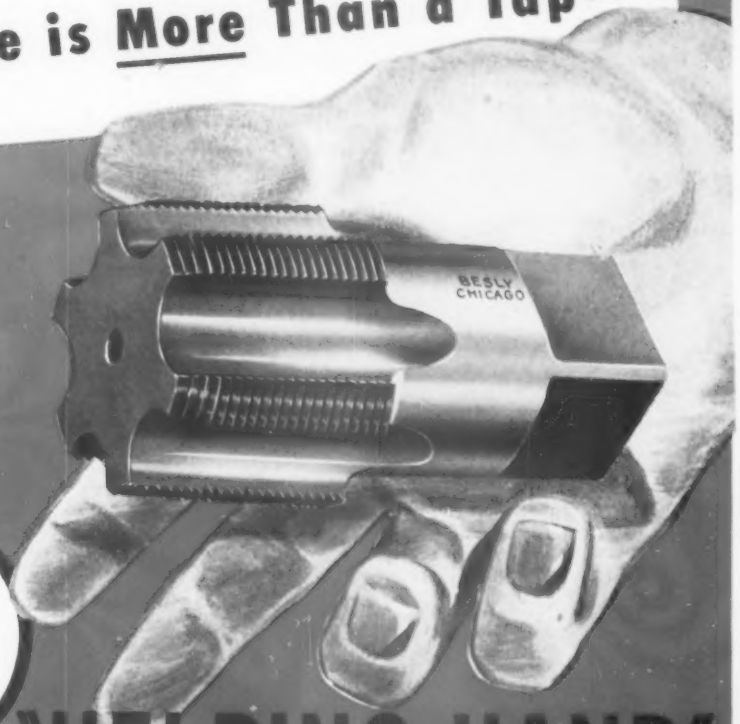
Tap Performance is More Than a Tap—



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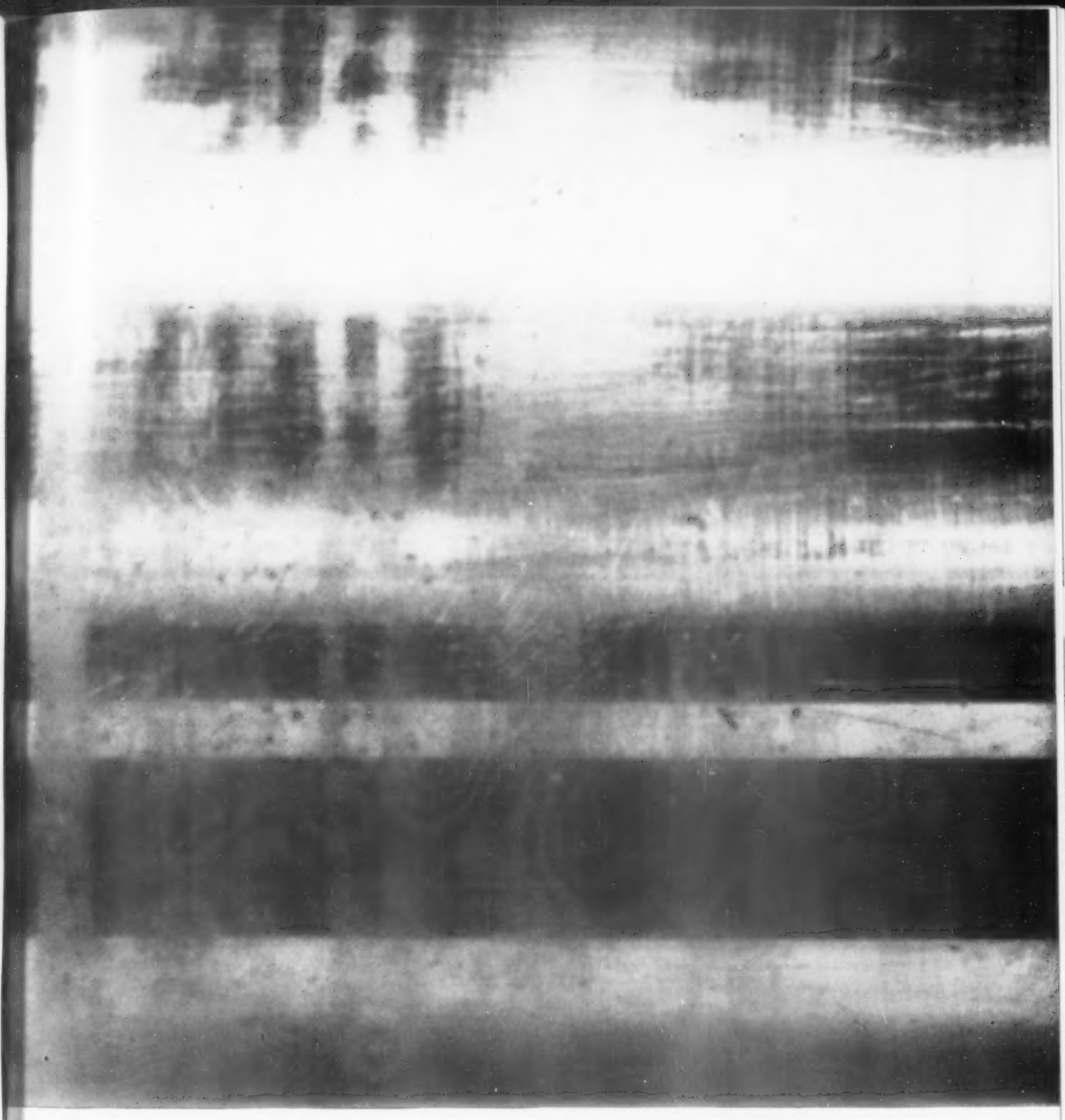

Close-up of *DANGER!*

The main bearing of this small crankshaft was originally finished by a mechanical sanding machine. Then it was partially Superfinished—just enough to reveal the lack of adequate bearing capacity. Light abraded areas are the only true geometrical surface. Dark areas are low spots which carry no bearing load. The area contact of the Superfinishing stone brings out deficiencies in production which were never intended by the designing engineer.

For more information on Superfinishing, write on your company letterhead for the new textbook, "Wear and Surface Finish."

GISHOLT MACHINE COMPANY
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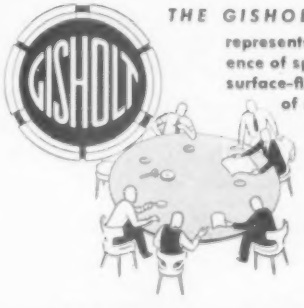

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

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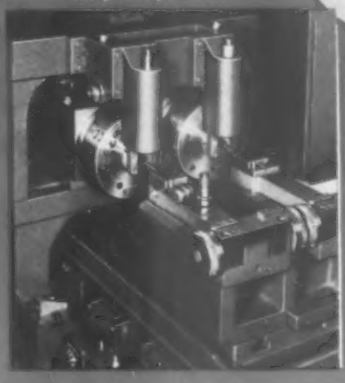
Index of Tool Engineer Advertisers

November, 1948

EX-CELL-O CAN GIVE YOU MORE ECONOMICAL PRODUCTION

Above: Full view of Ex-Cell-O Style 7112-A Precision Boring Machine arranged for automatic rough and finish boring of valve guide bushings. Parts enter chutes at left end of spindles, are fed through hollow spindle shafts to chucks, are rough and finish bored and ejected, all automatically, at the rate of *300 pieces per hour.*



Above: Automotive valve guide bushings with 11/32" holes, 2-3/16" long that are rough and finish bored on the machine shown above left.

Left: Close-up view of spindles and boring bar supports. Vertical castings in front of chucks house locating plungers that, when lowered, limit the forward travel of the bushings. Locators are withdrawn during boring and ejecting portions of cycle. Graduated dials on boring bar supports permit accurate adjustment of boring bar to control size of hole.

THIS ENTIRELY AUTOMATIC PRECISION BORING MACHINE IS TYPICAL OF EX-CELL-O SUPERIORITY IN ENGINEERING

● Here's a machine that receives automotive valve guide bushings from a conveyor line, rough and finish bores them and delivers them to another conveyor, all automatically. The bushings, 2-3/16" long with 11/32" bores, enter chutes at the left end of the spindles, are fed through the hollow spindle shafts to the chucks, are located, clamped, rough and finish bored and ejected at the rate of *300 pieces per hour.* Bores are held to a tolerance of .001". The operator need never touch the parts except to inspect the bores occasionally.

The engineering know-how that makes possible an automatic machine such as this one is always available to Ex-Cell-O customers, whether their work requires parts in short runs or great volume. Whether tolerances are measured in thousandths or ten-thousandths, Ex-Cell-O engineers will suggest the most practical and efficient method of finishing your parts. Call Ex-Cell-O today!

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Sheffield's interest does not diminish with the purchase of a Precisionaire. The instrument must be kept constantly useful. Quick tooling service from this great stock assures you uninterrupted performance throughout the long life of the instrument.

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- ***For grinding, boring, inspection and other operations.***
- ***Set up with standard gauge blocks . . . positive accuracy.***
- ***Permanent-magnet chuck holds work securely without distortion.***

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The Magna-Sine is set up by the sine bar method using standard gauge blocks. Work is clamped or released from the permanent magnet chuck instantly by turning the handle. The amount of magnet holding power is determined by the amount that the handle is turned—thus making it possible to hold extremely thin pieces without warpage.

Thousands of these versatile time-savers are in use daily. Many users have standardized on Magna-Sines for all angular work after seeing how the Magna-Sine pays for itself in just a few set-ups.

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